Academic Reading in Science

(ARIS)

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About Chris Elvin

Chris Elvin has an honors degree in organic chemistry from Liverpool University and a masters degree in TESOL from Temple University Japan. He is also the author of The Sixties: Activities for Students of English as a Second or Foreign Language, and Now You're Talking. He has over twenty years experience of teaching English as a foreign language and has been a contributor to Wikipedia since 2006.

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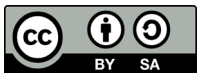

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1 Preface

1. **General Service Word list**
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1.1 The General Service Word List

The General Service Word List is a list of 2284 words considered to be most useful to a student of English. Each of the words in the list is a headword representing many similar words of a family. Although the list is rather long, especially considering that each word on the list represents other words, a student of academic reading should already have a good knowledge of these words. Even if you believe you know all of the words on the list, you should still review them from time to time.

John Bauman and Brent Culligan created the list in 1995.

a
ability
able
about
above
abroad
absence
absent
absolute
accept
accident
accord
account
accuse
accustom
ache
across
act
action
active
actor
actress
actual
add
address
admire
admission
admit
adopt
adoption
advance
advantage
adventure
advertise
advice
advise
affair
afford
afraid
after
afternoon
again
against
age
agency
agent
ago
agree
agriculture
ahead
aim
air
airplane
alike
alive
all
allow
allowance
almost
alone
along
aloud
already
also
although
altogether
always
ambition
ambitious
among
amongst
amount
amuse
ancient
and
anger
angle
angry
animal
annoy
annoyance
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answer
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anxious
any
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anyhow
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anything
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apart
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apple
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arrive
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association
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aunt
autumn
avenue
average
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avoidance
awake
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awkward
axe
baby
back
backward
bad
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balance
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bend
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berry
beside
besides
best
better
between
beyond
bicycle
big
bill
bind
bird
birth
bit
bite
bitter
black
blade
blame
bleed
bless
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blue
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body
boil
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book
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borrow
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bottle
bottom
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brass
brave
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break
breakfast
breath
breathe
bribe
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brick
bridge
bright
brighten
bring
broad
broadcast
brother
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brush
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build
bunch
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extraordinary
extreme
eye
face
fact
factory
fade
fail
failure
faint
fair
faith
fall
fame
familiar
family
fan
fancy
far
farm
fashion
fast
fasten
fat
fate
father
fatten
fault
favor
favorite
fear
feast
feather
feed
feel
fellow
fellowship
female
fence
fever
few
field
fierce
fight
figure
fill
film
find
fine
finger
finish
fire
firm
first
fish
fit
fix
flag
flame
flash
flat
flatten
flavor
flesh
float
flood
floor
flour
flow
flower
fly
fold
follow
fond
food
fool
foot
for
forbid
force
foreign
forest
forget
forgive
fork
form
formal
former
forth
fortunate
fortune
forward
frame
framework
free
freedom
freeze
frequency
frequent
fresh
friend
friendly
friendship
fright
frighten
from
front
fruit
fry
full
fun
funeral
funny
fur
furnish
furniture
further
future
gaiety
gain
gallon
game
gap
garage
garden
gas
gate
gather
gay
general
generous
gentle
gentleman
get
gift
girl
give
glad
glass
glory
go
goat
god
gold
golden
good
govern
governor
grace
gradual
grain
grammar
grammatical
grand
grass
grateful
grave
gray
grease
great
greed
green
greet
grind
ground
group
grow
growth
guard
guess
guest
guide
guilt
gun
habit
hair
half
hall
hammer
hand
handkerchief
handle
handshake
handwriting
hang
happen
happy
harbor
hard
harden
hardly
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harvest
haste
hasten
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hate
hatred
have
hay
he
head
headache
headdress
heal
health
heap
hear
heart
heat
heaven
heavenly
heavy
height
heighten
hello
help
here
hesitate
hesitation
hide
high
highway
hill
hinder
hindrance
hire
history
hit
hold
hole
holiday
hollow
holy
home
homecoming
homemade
homework
honest
honesty
honor
hook
hope
horizon
horizontal
horse
hospital
host
hot
hotel
hour
house
how
however
human
humble
hunger
hunt
hurrah
hurry
hurt
husband
hut
I
ice
idea
ideal
idle
if
ill
imaginary
imaginative
imagine
imitate
imitation
immediate
immense
importance
important
impossible
improve

in
inch
include
inclusive
increase
indeed
indoor
industry
influence
influential
inform
ink
inn
inquire
inquiry
insect
inside
instant
instead
instrument
insult
insurance
insure
intend
intention
interest
interfere
interference
international
interrupt
interruption
into
introduce
introduction
invent
invention
inventor
invite
inward
iron
island
it
jaw
jealous
jealousy
jewel
join
joint
joke
journey
joy
judge
juice
jump
just
justice
keep
key
kick
kill
kind
king
kingdom
kiss
kitchen
knee
kneel
knife
knock
knot
know
knowledge
lack
ladder
lady
lake
lamp
land
landlord
language
large
last
late
lately
latter
laugh
laughter
law
lawyer
lay
lazy
lead
leadership
leaf
lean
learn
least
leather
leave
left
leg
lend
length
lengthen
less
lessen
lesson
let
letter
level
liar
liberty
librarian
library
lid
lie
life
lift
light
lighten
like
likely
limb
limit
line
lip
lipstick
liquid
list
listen
literary
literature
little
live
load
loaf
loan
local
lock
lodge
log
lonely
long
look
loose
loosen
lord
lose
loss
lot
loud
love
lovely
low
loyal
loyalty
luck
lump
lunch
lung
machine
machinery
mad
madden
mail
main
make
male
man
manage
mankind
manner
manufacture
many
map
march
mark
market
marriage
marry
mass
master
mat
match
material
matter
may
maybe
meal
mean
meantime
meanwhile
measure
meat
mechanic
mechanism
medical
medicine
meet
melt
member
membership
memory
mend
mention
merchant
mercy
mere
merry
message
messenger
metal
middle
might
mild
mile
milk
mill
mind
mine
mineral
minister
minute
miserable
misery
miss
mistake
mix
mixture
model
moderate
moderation
modern
modest
modesty
moment
momentary
money
monkey
month
moon
moonlight
moral
more
moreover
morning
most
mother
motherhood
motherly
motion
motor
mountain
mouse
mouth
move
much
mud
multiplication
multiply
murder
music
musician
must
mystery
nail
name
narrow
nation
native
nature
near
neat
necessary
necessity
neck
need
needle
neglect
neighbor
neighborhood
neither
nephew
nest
net
network
never
new
news
newspaper
next
nice
niece
night
no
noble
nobody
noise
none
noon
nor
north
northern
nose
not
note
notebook
nothing
notice
noun
now
nowadays
nowhere
nuisance
number
numerous
nurse
nursery
nut
oar
obedience
obedient
obey
object
objection
observe
occasion
ocean
of
off
offend
offense
offer
office
officer

official
often
oil
old
old-fashioned
omission
omit
on
once
one
only
onto
open
operate
operation
operator
opinion
opportunity
oppose
opposite
opposition
or
orange
order
ordinary
organ
organize
origin
ornament
other
otherwise
ought
ounce
out
outline
outside
outward
over
overcome
overflow
owe
own
ownership
pack
package
pad
page
pain
paint
pair
pale
pan
paper
parcel
pardon
parent
park
part
particle
particular
partner
party
pass
passage
passenger
past
paste
pastry
path
patience
patient
patriotic
pattern
pause
paw
pay
peace
pearl
peculiar
pen
pencil
penny
people
per
perfect
perfection
perform
performance
perhaps
permanent
permission
permit
person
persuade
persuasion
pet
photograph
photography
pick
picture
piece
pig
pigeon
pile
pin
pinch
pink
pint
pipe
pity
place
plain
plan
plant
plaster
plate
play
pleasant
please
pleasure
plenty
plow
plural
pocket
poem
poet
point
poison
police
polish
polite
political
politician
politics
pool
poor
popular
population
position
possess
possession
possessor
possible
post
postpone
pot
pound
pour
poverty
powder
power
practical
practice
praise
pray
preach
precious
prefer
preference
prejudice
prepare
presence
present
preserve
president
press
pressure
pretend
pretense
pretty
prevent
prevention
price
pride
priest
print
prison
private
prize
probable
problem
procession
produce
product
production
profession
profit
program
progress
promise
prompt
pronounce
pronunciation
proof
proper
property
proposal
propose
protect
protection
proud
prove
provide
public
pull
pump
punctual
punish
pupil
pure
purple
purpose
push
put
puzzle
qualification
qualify
quality
quantity
quarrel
quart
quarter
queen
question
quick
quiet
quite
rabbit
race
radio
rail
railroad
rain
raise
rake
rank
rapid
rare
rate
rather
raw
ray
razor
reach
read
ready
real
realize
reason
reasonable
receipt
receive
recent
recognition
recognize
recommend
record
red
redden
reduce
reduction
refer
reference
reflect
reflection
refresh
refuse
regard
regret
regular
rejoice
relate
relation
relative
relief
relieve
religion
remain
remark
remedy
remember
remind
rent
repair
repeat
repetition
replace
reply
report
represent
representative
reproduce
reproduction
republic
reputation
request
rescue
reserve
resign
resist
resistance
respect
responsible
rest
restaurant
result
retire
return
revenge
review
reward
ribbon
rice
rich
rid
ride
right
ring
ripe
ripen
rise
risk
rival
rivalry
river
road
roar
roast
rob
robbery
rock
rod
roll
roof
room

root
rope
rot
rotten
rough
round
row
royal
royalty
rub
rubber
rubbish
rude
rug
ruin
rule
run
rush
rust
sacred
sacrifice
sad
sadden
saddle
safe
safety
sail
sailor
sake
salary
sale
salesman
salt
same
sample
sand
satisfaction
satisfactory
satisfy
sauce
saucer
save
saw
say
scale
scarce
scatter
scene
scenery
scent
school
science
scientific
scientist
scissors
scold
scorn
scrape
scratch
screen
screw
sea
search
season
seat
second
secrecy
secret
secretary
see
seed
seem
seize
seldom
self
selfish
sell
send
sense
sensitive
sentence
separate
separation
serious
servant
serve
service
set
settle
several
severe
sew
shade
shadow
shake
shall
shallow
shame
shape
share
sharp
sharpen
shave
she
sheep
sheet
shelf
shell
shelter
shield
shilling
shine
ship
shirt
shock
shoe
shoot
shop
shore
short
shorten
should
shoulder
shout
show
shower
shut
sick
side
sight
sign
signal
signature
silence
silent
silk
silver
simple
simplicity
since
sincere
sing
single
sink
sir
sister
sit
situation
size
skill
skin
skirt
sky
slave
slavery
sleep
slide
slight
slip
slippery
slope
slow
small
smell
smile
smoke
smooth
snake
snow
so
soap
social
society
sock
soft
soften
soil
soldier
solemn
solid
solution
solve
some
somebody
somehow
someone
something
sometime
sometimes
somewhere
son
song
soon
sore
sorrow
sorry
sort
soul
sound
soup
sour
south
sow
space
spade
spare
speak
special
speech
speed
spell
spend
spill
spin
spirit
spit
spite
splendid
split
spoil
spoon
sport
spot
spread
spring
square
staff
stage
stain
stair
stamp
stand
standard
star
start
state
station
stay
steady
steam
steel
steep
steer
stem
step
stick
stiff
stiffen
still
sting
stir
stock
stocking
stomach
stone
stop
store
storm
story
stove
straight
straighten
strange
strap
straw
stream
street
strength
strengthen
stretch
strict
strike
string
strip
stripe
stroke
strong
struggle
student
study
stuff
stupid
subject
substance
succeed
success
such
suck
sudden
suffer
sugar
suggest
suggestion
suit
summer
sun
supper
supply
support
suppose
sure
surface
surprise
surround
suspect
suspicion
suspicious
swallow
swear
sweat
sweep
sweet
sweeten
swell
swim
swing
sword
sympathetic
sympathy
system
table
tail
tailor
take
talk
tall
tame
tap
taste
tax
taxi
tea
teach
tear
telegraph

telephone
tell
temper
temperature
temple
tempt
tend
tender
tent
term
terrible
test
than
thank
that
the
theater
theatrical
then
there
therefore
these
they
thick
thicken
thief
thin
thing
think
thirst
this
thorn
thorough
those
though
thread
threat
threaten
throat
through
throw
thumb
thunder
thus
ticket
tide
tidy
tie
tight
tighten
till
time
tin
tip
tire
title
to
tobacco
today
toe
together
tomorrow
ton
tongue
tonight
too
tool
tooth
top
total
touch
tough
tour
toward
towel
tower
town
toy
track
trade
train
translate
translation
translator
trap
travel
tray
treasure
treasury
treat
tree
tremble
trial
tribe
trick
trip
trouble
true
trunk
trust
truth
try
tube
tune
turn
twist
type
ugly
umbrella
uncle
under
underneath
understand
union
unit
unite
unity
universal
universe
university
unless
until
up
upon
upper
uppermost
upright
upset
urge
urgent
use
usual
vain
valley
valuable
value
variety
various
veil
verb
verse
very
vessel
victory
view
village
violence
violent
virtue
visit
visitor
voice
vote
vowel
voyage
wage
waist
wait
waiter
wake
walk
wall
wander
want
war
warm
warmth
warn
wash
waste
watch
water
wave
wax
way
we
weak
weaken
wealth
weapon
wear
weather
weave
weed
week
weekday
weekend
weigh
weight
welcome
well
west
western
wet
what
whatever
wheat
wheel
when
whenever
where
wherever
whether
which
whichever
while
whip
whisper
whistle
white
whiten
who
whoever
whole
whom
whose
why
wicked
wide
widen
widow
widower
width
wife
wild
will
win
wind
window
wine
wing
winter
wipe
wire
wisdom
wise
wish
with
within
without
witness
woman
wonder
wood
wooden
wool
woolen
word
work
world
worm
worry
worse
worship
worth
would
wound
wrap
wreck
wrist
write
wrong
yard
year
yellow
yes
yesterday
yet
yield
you
young
youth

1.2 The Academic Word List

There are 570 word families in the Academic Word List (Coxhead). These words are divided into 10 sublists, and ranked in order of frequency of their occurrence in academic texts. The most frequent academic words are in sublist 1, and the least frequent words are in sublist 10. Words within a sublist are ordered alphabetically rather than order of frequency. The words in the list below are the most frequent words of each family only. (For a list of family words, see Appendix 8.2).

Coxhead, Averil. (2000). A new academic word list. TESOL Quarterly, 34, 213-238.

Sublist 1

analysis	constitutional	established	indicate	occur	role
approach	context	estimate	individual	percent	section
area	contract	evidence	interpretation	period	sector
assessment	create	export	involved	policy	significant
assume	data	factors	issues	principle	similar
authority	definition	financial	labour	procedure	source
available	derived	formula	legal	process	specific
benefit	distribution	function	legislation	required	structure
concept	economic	identified	major	research	theory
consistent	environment	income	method	response	variable

Sublist 2

achieve	community	design	institute	potential	restricted
acquisition	complex	distinction	investment	previous	security
administration	computer	elements	items	primary	sought
affect	conclusion	equation	journal	purchase	select
appropriate	conduct	evaluation	maintenance	range	site
aspects	consequences	features	normal	region	strategies
assistance	construction	final	obtained	regulations	survey
categories	consumer	focus	participation	relevant	text
chapter	credit	impact	perceived	resident	traditional
commission	cultural	injury	positive	resources	transfer

Sublist 3

alternative	convention	emphasis	interaction	philosophy	sex
circumstances	coordination	ensure	justification	physical	shift
comments	core	excluded	layer	proportion	specified
compensation	corporate	framework	link	published	sufficient
components	corresponding	funds	location	reaction	task
consent	criteria	illustrated	maximum	registered	technical
considerable	deduction	immigration	minorities	reliance	techniques
constant	demonstrate	implies	negative	removed	technology
constraints	document	initial	outcomes	scheme	validity
contribution	dominant	instance	partnership	sequence	volume

Sublist 4

access	communication	error	internal	parallel	resolution
adequate	concentration	ethnic	investigation	parameters	retained
annual	conference	goals	job	phase	series
apparent	contrast	granted	label	predicted	statistics
approximated	cycle	hence	mechanism	principal	status
attitudes	debate	hypothesis	obvious	prior	stress
attributed	despite	implementation	occupational	professional	subsequent
civil	dimensions	implications	option	project	sum
code	domestic	imposed	output	promote	summary
commitment	emerged	integration	overall	regime	undertaken

Sublist 5

academic	consultation	evolution	licence	orientation	styles
adjustment	contact	expansion	logic	perspective	substitution
alter	decline	exposure	marginal	precise	sustainable
amendment	discretion	external	medical	prime	symbolic
aware	draft	facilitate	mental	psychology	target
capacity	enable	fundamental	modified	pursue	transition
challenge	energy	generated	monitoring	ratio	trend
clause	enforcement	generation	network	rejected	version
compounds	entities	image	notion	revenue	welfare
conflict	equivalent	liberal	objective	stability	whereas

Sublist 6

abstract	capable	exceed	incidence	migration	recovery
accurate	cited	expert	incorporated	minimum	revealed
acknowledged	cooperative	explicit	index	ministry	scope
aggregate	discrimination	federal	inhibition	motivation	subsidiary
allocation	display	fees	initiatives	neutral	tapes
assigned	diversity	flexibility	input	nevertheless	trace
attached	domain	furthermore	instructions	overseas	transformation
author	edition	gender	intelligence	preceding	transport
bond	enhanced	ignored	interval	presumption	underlying
brief	estate	incentive	lecture	rational	utility

Sublist 7

adaptation	contrary	empirical	identical	phenomenon	submitted
adults	converted	equipment	ideology	priority	successive
advocate	couple	extract	inferred	prohibited	survive
aid	decades	file	innovation	publication	thesis
channel	definite	finite	insert	quotation	topic
chemical	deny	foundation	intervention	release	transmission
classical	differentiation	global	isolated	reverse	ultimately
comprehensive	disposal	grade	media	simulation	unique
comprise	dynamic	guarantee	mode	solely	visible
confirmed	eliminate	hierarchical	paradigm	somewhat	voluntary

Sublist 8

abandon	clarity	deviation	induced	plus	tension
accompanied	conformity	displacement	inevitably	practitioners	termination
accumulation	commodity	dramatic	infrastructure	predominantly	theme
ambiguous	complement	eventually	inspection	prospect	thereby
appendix	contemporary	exhibit	intensity	radical	uniform
appreciation	contradiction	exploitation	manipulation	random	vehicle
arbitrary	crucial	fluctuations	minimised	reinforced	via
automatically	currency	guidelines	nuclear	restore	virtually
bias	denote	highlighted	offset	revision	widespread
chart	detected	implicit	paragraph	schedule	visual

Sublist 9

accommodation	commenced	duration	mature	preliminary	sphere
analogous	incompatible	erosion	mediation	protocol	subordinate
anticipated	concurrent	ethical	medium	qualitative	supplementary
assurance	confined	format	military	refine	suspended
attained	controversy	founded	minimal	relaxed	team
behalf	conversely	inherent	mutual	restraints	temporary
bulk	device	insights	norms	revolution	trigger
ceases	devoted	integral	overlap	rigid	unified
coherence	diminished	intermediate	passive	route	violation
coincide	distortion	manual	portion	scenario	vision

Sublist 10

adjacent	compiled	enormous	invoked	odd	reluctant
albeit	conceived	forthcoming	levy	ongoing	so-called
assembly	convinced	inclination	likewise	panel	straightforward
collapse	depression	integrity	nonetheless	persistent	undergo
colleagues	encountered	intrinsic	notwithstanding	posed	whereby

1.3 Reading for Pleasure

Why should I read for pleasure?

Experimental studies have shown that people who read regularly for fun increase their reading fluency, learn and develop reading strategies, increase vocabulary knowledge, and also gain motivation to continue to read. Consequently, students who read regularly for fun not only increase their reading proficiency, but also listening, speaking and writing proficiency, too. These scientific studies have shown the clear benefits of reading for pleasure, so why don't you consider spending a little of your free time in reading for fun? After all, it's easy and it's fun!

What should I read?

It's up to you, as long as you choose something not too difficult nor too easy. Ideally, you should understand at least ninety-five percent of the words that you are reading. Then, you will enjoy reading and also learn, too. If you understand all of the words, you may not develop reading strategies, such as guessing the meaning of a word from its context, so please make sure that your chosen text is also not too easy. What you read should be entirely up to you, although asking your teacher or friends for suggestions may be a good idea if you don't know where to start.

How much should I read and how often?

The more you practice, the better you will be. The benefits of reading for pleasure do not come in the short term, but you should consider the long term benefits justify the commitment needed. If you read for thirty minutes a day, every day, you will likely succeed. If you record how much you read, you will be able to chart your progress.

Reading for Pleasure Record

	Date	What did you read?	How many pages?	How many minutes or hours?
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
			TOTAL	**hours**

Reading for Pleasure Record

	Date	What did you read?	How many pages?	How many minutes or hours?
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
			TOTAL	**hours**

2 Analyzing Text

1. **Topics and Main Ideas**
2. **Logical Connectors and the Development of Ideas**
3. **Text Organization**

2.1 Topics and Main Ideas

What is a paragraph?

A paragraph is a series of sentences which discuss a single topic. There is no limit to the number of sentences a paragraph may have, and even one long sentence may be considered a paragraph. Many paragraphs are between five and fifteen sentences, but more important than the number of actual sentences is that a paragraph relates to just one idea or single topic. A paragraph is also organized as a block of text so as to distinguish it from previous and subsequent paragraphs.
For example, the sentences below are a paragraph because they discuss a single topic (science), and because they are organized as a single block of text.

> Science, in the broadest sense of the term, refers to any system of knowledge attained by verifiable means. In a more restricted sense, science refers to a system of acquiring knowledge based on empiricism, experimentation, and methodological naturalism, as well as to the organized body of knowledge humans have gained by such qualified research.

The importance of topic sentences in paragraphs

A paragraph is a series of sentences which discuss a single topic. Consequently, there should be two questions that you ask yourself when you read a paragraph. The first is, "What is the topic of the paragraph?", and the second is "How is this topic being discussed?" In other words, you should be looking for the topic and the main idea. In most texts, the topic and main idea are usually expressed together in a single sentence that we refer to as the topic sentence. An important skill in reading, therefore, is to be able to find the most important sentence of a paragraph, the topic sentence.

What is a topic sentence?

A topic sentence is the most important sentence of a paragraph. It is a complete sentence, and it has two main functions. The first is to introduce the topic, and the second is to tell the reader the main idea, or why or for what purpose the writer is writing about such a topic.

Where is the topic sentence to be found?

A topic sentence can occur anywhere in the paragraph. It can be at the beginning, the middle, or the end. On some occasions, there may be no topic sentence, but even so, the writer will always imply a topic and a main idea in a paragraph because every paragraph, by definition, discusses a single topic. Fortunately, in academic writing, the topic sentence is often the first sentence of the paragraph, but you should remember that this is not always the case.

Here is an example paragraph.

> The liver is a vital organ present in vertebrates and some other animals.

It has a wide range of functions, including detoxification, protein synthesis, and production of biochemicals necessary for digestion. The liver is necessary for survival; there is currently no way to compensate for the absence of liver function.

topic: The liver

topic sentence or main idea: The liver is a vital organ present in vertebrates and some other animals.

2.1 Topics and Main Ideas

Read the paragraphs below. What is the topic? What is the main idea?

Example

A topic sentence is the most important sentence of a paragraph. It is a complete sentence, and it has two main functions. The first is to introduce the topic, and the second is to tell the reader the main idea, or why or for what purpose the writer is writing about such a topic.

topic: topic sentences

topic sentence or main idea: A topic sentence is the most important sentence of a paragraph.

1 A computer is a programmable machine that receives input, stores and manipulates data, and provides output in a useful format. Although mechanical examples of computers have existed through much of recorded human history, the first electronic computers were developed in the mid-20th century (1940–1945). These were the size of a large room, consuming as much power as several hundred modern personal computers (PCs). Modern computers based on integrated circuits are millions to billions of times more capable than the early machines, and occupy a fraction of the space. Simple computers are small enough to fit into small pocket devices, and can be powered by a small battery. Personal computers in their various forms are icons of the Information Age and are what most people think of as "computers". The embedded computers found in many devices from MP3 players to fighter aircraft and from toys to industrial robots are however the most numerous.

http://en.wikipedia.org/wiki/Computer

topic: .....

topic sentence or main idea:

.....

2 Geometry (Ancient Greek: geo- "earth", -metria "measurement") "Earth-Measuring" is a part of mathematics concerned with questions of size, shape, relative position of figures, and the properties of space. Geometry is one of the oldest sciences. Initially a body of practical knowledge concerning lengths, areas, and volumes, in the 3rd century BC, geometry was put into an axiomatic

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form by Euclid, whose treatment—Euclidean geometry—set a standard for many centuries to follow. The field of astronomy, especially mapping the positions of the stars and planets on the celestial sphere, served as an important source of geometric problems during the next one and a half millennia. A mathematician who works in the field of geometry is called a geometer.

http://en.wikipedia.org/wiki/Geometry

topic: .....

topic sentence or main idea:

.....

3 Ecology is the interdisciplinary scientific study of the interactions between organisms and their environment. Ecology is also the study of ecosystems. Ecosystems describe the web or network of relations among organisms at different scales of organization. Since ecology refers to any form of biodiversity, ecologists research everything from tiny bacteria's role in nutrient recycling to the effects of tropical rain forest on the Earth's atmosphere. The discipline of ecology emerged from the natural sciences in the late 19th century. Ecology is not synonymous with environment, environmentalism, or environmental science. Ecology is closely related to the disciplines of physiology, evolution, genetics and behavior.

http://en.wikipedia.org/wiki/Ecology

topic: .....

topic sentence or main idea:

.....

4 Pure white marble is the result of metamorphism of very pure limestones. The characteristic swirls and veins of many colored marble varieties are usually due to various mineral impurities such as clay, silt, sand, iron oxides, or chert which were originally present as grains or layers in the limestone. Green coloration is often due to serpentine resulting from originally high magnesium limestone or dolostone with silica impurities. These various impurities have been mobilized and recrystallized by the intense pressure and heat of the metamorphism.

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http://en.wikipedia.org/wiki/Marble

topic: .....

topic sentence or main idea:

.....

5 Some of the greatest mathematical minds of all ages, from Pythagoras and Euclid in ancient Greece, through the medieval Italian mathematician Leonardo of Pisa and the Renaissance astronomer Johannes Kepler, to present-day scientific figures such as Oxford physicist Roger Penrose, have spent endless hours over this simple ratio and its properties. But the fascination with the golden ratio is not confined just to mathematicians. Biologists, artists, musicians, historians, architects, psychologists, and even mystics have pondered and debated the basis of its ubiquity and appeal. In fact, it is probably fair to say that the golden ratio has inspired thinkers of all disciplines like no other number in the history of mathematics.

http://en.wikipedia.org/wiki/Golden_ratio

topic: .....

topic sentence or main idea:

.....

6 In physics, tension is the magnitude of the pulling force exerted by a string, cable, chain, or similar object on another object. It is the opposite of compression. As tension is the magnitude of a force, it is measured in newtons (or sometimes pounds-force) and is always measured parallel to the string on which it applies. There are two basic possibilities for systems of objects held by strings. Either acceleration is zero and the system is therefore in equilibrium or there is acceleration and therefore a net force is present. Note that a string is assumed to have negligible mass.

http://en.wikipedia.org/wiki/Tension_(physics)

topic: .....

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topic sentence or main idea:

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7 Elementary particles are particles for which there is no known way of dividing them into smaller units. Theoretical and experimental studies have shown that the spin possessed by such particles cannot be explained by postulating that they are made up of even smaller particles rotating about a common center of mass (see classical electron radius); as far as can be determined, these elementary particles are true point particles. The spin of an elementary particle is a truly intrinsic physical property, akin to the particle's electric charge and rest mass.

http://en.wikipedia.org/wiki/Spin_(physics)

topic: .....

topic sentence or main idea:

.....

8 The Coriolis effect on Earth is due to this fact: the Earth is rotating fastest at the equator, and rotates not at all at the poles (in km/hr). A bird flying N away from the equator, carries this faster motion with it (or, equivalently, the earth under the bird is rotating more slowly than it was) - and the bird's flight curves eastward slightly (though its heading stays straight N). In general: objects moving away from the equator curve eastward; objects moving towards the equator curve westward. Moving away from the equator, the land underneath rotates more slowly, and vice-versa. An object gains or loses relative speed over ground as it moves away from, or towards, the equator, respectively.

http://en.wikipedia.org/wiki/Coriolis_effect

topic: .....

topic sentence or main idea:

.....

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9 It is still a challenge for scientists and philosophers to define life in unequivocal terms. Any definition must be sufficiently broad to encompass all life with which we are familiar, and it should be sufficiently general that, with it, scientists would not miss life that may be fundamentally different from earthly life. Defining life is difficult — in part — because life is a process, not a pure substance.

http://en.wikipedia.org/wiki/Life

topic: .....

topic sentence or main idea:

.....

10 Genetics (from Ancient Greek: genesis, "origin"), a discipline of biology, is the science of heredity and variation in living organisms. The fact that living things inherit traits from their parents has been used since prehistoric times to improve crop plants and animals through selective breeding. However, the modern science of genetics, which seeks to understand the process of inheritance, only began with the work of Gregor Mendel in the mid-nineteenth century. Although he did not know the physical basis for heredity, Mendel observed that organisms inherit traits via discrete units of inheritance, which are now called genes.

http://en.wikipedia.org/wiki/Genetics

topic: .....

topic sentence or main idea:

.....

11 In biochemistry, metabolic pathways are series of chemical reactions occurring within a cell. In each pathway, a principal chemical is modified by chemical reactions. Enzymes catalyze these reactions, and often require dietary minerals, vitamins, and other cofactors in order to function properly. Because of the many chemicals that may be involved, pathways can be quite elaborate. In addition, many pathways can exist within a cell. This collection of pathways is called the metabolic network. Pathways are important to the maintenance of homeostasis within an organism.

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http://en.wikipedia.org/wiki/Metabolic_pathways

topic: .....

topic sentence or main idea:

.....

12 Evidence from radiometric dating indicates that the Earth is about 4.570 billion years old. The geological or deep time of Earth's past has been organized into various units according to events which took place in each period. Different spans of time on the time scale are usually delimited by major geological or paleontological events, such as mass extinctions. For example, the boundary between the Cretaceous period and the Paleogene period is defined by the Cretaceous–Tertiary extinction event, which marked the demise of the dinosaurs and of many marine species. Older periods which predate the reliable fossil record are defined by absolute age.

http://en.wikipedia.org/wiki/Geologic_time_scale

topic: .....

topic sentence or main idea:

.....

13 Romans are generally famous for their advanced engineering accomplishments, although some of their own inventions were improvements on older ideas, concepts and inventions. Technology for bringing running water into cities was developed in the east, but transformed by the Romans into a technology inconceivable in Greece. The architecture used in Rome was strongly influenced by Greek and Etruscan sources. Roads were common at that time, but the Romans improved their design and perfected the construction to the extent that many of their roads are still in use today. Their accomplishments surpassed most other civilizations of the time, and many of their structures have withstood the test of time to inspire others, especially during the Renaissance. Moreover, their contributions were described in some detail by authors such as Vitruvius, Frontinus and Pliny the Elder, so there is a printed record of their many inventions and achievements.

http://en.wikipedia.org/wiki/Roman_engineering

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topic: .....

topic sentence or main idea:

.....

14 Natural numbers have two main purposes: counting ("there are 6 coins on the table") and ordering ("this is the 3rd largest city in the country"). These purposes are related to the linguistic notions of cardinal and ordinal numbers, respectively. A more recent notion is that of a nominal number, which is used only for naming.

http://en.wikipedia.org/wiki/Natural_numbers

topic: .....

topic sentence or main idea:

.....

15 The Doppler effect (or Doppler shift), named after Austrian physicist Christian Doppler who proposed it in 1842, is the change in frequency of a wave for an observer moving relative to the source of the wave. It is commonly heard when a vehicle sounding a siren or horn approaches, passes, and recedes from an observer. The received frequency is higher (compared to the emitted frequency) during the approach, it is identical at the instant of passing by, and it is lower during the recession.

http://en.wikipedia.org/wiki/Doppler_effect

topic: .....

topic sentence or main idea:

.....

16 Stars with more than about 10 solar masses after burning their hydrogen become red supergiants during their helium-burning phase. These stars have

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very cool surface temperatures (3500–4500 K), and enormous radii. The five largest known red supergiants in the Galaxy are VY Canis Majoris, VV Cephei A, V354 Cephei, RW Cephei and KW Sagittarii, which all have radii about 1500 times that of the sun (about 7 astronomical units, or 7 times as far as the Earth is from the sun). The radius of most red giants is between 200 and 800 times that of the sun.

http://en.wikipedia.org/wiki/Red_supergiants

topic: .....

topic sentence or main idea:

.....

17 Plants are the base of the food chain, and need sunlight and nutrients if they are to grow. In the ocean these plants are mainly a type of plankton, microscopic phytoplankton which drift in the water column. They need sunlight for photosynthesis, which powers carbon fixation, so they are found only in the surface waters. But they also need nutrients. Phytoplankton rapidly use any nutrients in the surface waters, and in the tropics these nutrients are not usually replaced because of the thermocline.

http://en.wikipedia.org/wiki/Coral_reef

topic: .....

topic sentence or main idea:

.....

18 Researchers rarely survey the entire population for two reasons: (1) The cost is too high and (2) The population is dynamic, i.e., the component of population could change over time. There are three main advantages of sampling: (1) The cost is lower, (2) Data collection is faster, and (3) It is possible to ensure homogeneity and to improve the accuracy and quality of the data because the data set is smaller.

http://en.wikipedia.org/wiki/Sampling_(statistics)

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topic: .....

topic sentence or main idea:

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19 The presence of ocean blooms is usually seasonal, responding to prey availability and increasing with temperature and sunshine. Ocean currents tend to congregate jellyfish into large swarms or "blooms", consisting of hundreds or thousands of individuals. In addition to sometimes being concentrated by ocean currents, blooms can result from unusually high populations in some years. Bloom formation is a complex process that depends on ocean currents, nutrients, temperature and oxygen concentrations. Jellyfish are better able to survive in oxygen-poor water than competitors, and thus can thrive on plankton without competition. Jellyfish may also benefit from saltier waters, as saltier waters contain more iodine, which is necessary for polyps to turn into jellyfish. Rising sea temperatures caused by climate change may also contribute to jellyfish blooms, because many species of jellyfish are better able to survive in warmer waters. Jellyfish are likely to stay in blooms that are quite large and can reach up to 100,000 in each.

http://en.wikipedia.org/wiki/Jellyfish

topic: .....

topic sentence or main idea:

.....

20 The term chiral in general is used to describe an object that is non-superposable on its mirror image. Achiral (not chiral) objects are objects that are identical to their mirror image. Human hands are perhaps the most universally recognized example of chirality: The left hand is a non-superposable mirror image of the right hand; no matter how the two hands are oriented, it is impossible for all the major features of both hands to coincide. This difference in symmetry becomes obvious if someone attempts to shake the right hand of a person using his left hand, or if a left-handed glove is placed on a right hand. The term chirality is derived from the Greek word for hand. It is a mathematical approach to the concept of "handedness".

http://en.wikipedia.org/wiki/Chirality_(chemistry)

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topic: .....

topic sentence or main idea:

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21 The general public sometimes confuses computer science with careers that deal with computers (such as information technology), or think that it relates to their own experience of computers, which typically involves activities such as gaming, web-browsing, and word-processing. However, the focus of computer science is more on understanding the properties of the programs used to implement software such as games and web-browsers, and using that understanding to create new programs or improve existing ones.

http://en.wikipedia.org/wiki/Computer_science

topic: .....

topic sentence or main idea:

.....

22 Over half of Costa Rica's existing forest cover today is under the protection of national parks, biological reserves, or wildlife refuges. However, the major problem in regards to deforestation is the privately owned plots which occupy the other half. Lenient laws on land and amendments to forestry law makes it easy to obtain logging concessions as owners exploit the land to maximise income. As logging companies enter these forests to exploit them, they require access roads to transport the timber. While cattle ranching is by far the primary cause of deforestation in Costa Rica, banana plantations have also significantly contributed to the problem. Lowland rainforest has been most affected where 130,000 acres of previously forested land (primarily in the Atlantic and Northern regions) have been removed. Such industries have been synonymous with health risks, notably the high levels of toxic pesticides which affected thousands of plantation workers throughout Central America in the 1970s. Pesticides used to grow bananas and other fruits such as mangoes and citrus fruit may enter the hydrological systems and contaminate the water. The removal of the forest to make way for these fruit plantations may also disrupt the nutrient balance in the soil and through monoculture exhaust the soils and render them unsustainable.

http://en.wikipedia.org/wiki/Deforestation_in_Costa_Rica

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topic: .....

topic sentence or main idea:

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23 The International Union for Conservation of Nature now lists global warming as the most significant threat to the polar bear, primarily because the melting of its sea ice habitat reduces its ability to find sufficient food. The IUCN states, "If climatic trends continue, polar bears may become extirpated from most of their range within 100 years." On 14 May 2008, the United States Department of the Interior listed the polar bear as a threatened species under the Endangered Species Act.

http://en.wikipedia.org/wiki/Polar_bear

topic: .....

topic sentence or main idea:

.....

24 Researchers at the University of Warwick and University College London have found that lack of sleep can more than double the risk of death from cardiovascular disease, but that too much sleep can also be associated with a doubling of the risk of death, though not primarily from cardiovascular disease. Professor Francesco Cappuccio said, "Short sleep has been shown to be a risk factor for weight gain, hypertension, and Type 2 diabetes, sometimes leading to mortality; but in contrast to the short sleep-mortality association, it appears that no potential mechanisms by which long sleep could be associated with increased mortality have yet been investigated. Some candidate causes for this include depression, low socioeconomic status, and cancer-related fatigue. ...In terms of prevention, our findings indicate that consistently sleeping around seven hours per night is optimal for health, and a sustained reduction may predispose to ill health."

http://en.wikipedia.org/wiki/Sleep

topic: .....

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topic sentence or main idea:

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25 Philosophers in antiquity used the concept of force in the study of stationary and moving objects and simple machines, but thinkers such as Aristotle and Archimedes retained fundamental errors in understanding force, due to an incomplete understanding of the sometimes non-obvious force of friction, and a consequently inadequate view of the nature of natural motion. When the Age of Enlightenment began, Sir Isaac Newton corrected these misunderstandings with mathematical insight that remained unchanged for nearly three hundred years. By the early 20th century, Einstein developed a theory of relativity that correctly predicted the action of forces on objects with increasing momenta near the speed of light, and also provided insight into the "forces" produced by gravitation and inertia.

http://en.wikipedia.org/wiki/Force

topic: .....

topic sentence or main idea:

.....

26 The effects of calcium on human cells are specific, meaning different types of cells respond in different ways. However, in certain circumstances its action may be more general. Ca2+ ions are one of the most widespread second messengers used in signal transduction. They make their entrance into the cytoplasm either from outside the cell through the cell membrane via calcium channels (such as Calcium-binding proteins or voltage-gated calcium channels), or from some internal calcium storages such as the endoplasmic reticulum and mitochondria. Levels of intracellular calcium are regulated by transport proteins that remove it from the cell. For example, the sodium-calcium exchanger uses energy from the electrochemical gradient of sodium by pumping calcium out of the cell in exchange for the entry of sodium. Additionally, the plasma membrane Ca2+ ATPase (PMCA) obtains energy to pump calcium out of the cell by hydrolyzing adenosine triphosphate (ATP). In neurons, voltage-dependent, calcium-selective ion channels are important for synaptic transmission through the release of neurotransmitters into the synaptic cleft by vesicle fusion of synaptic vesicles.

http://en.wikipedia.org/wiki/Calcium_in_biology

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topic: .....

topic sentence or main idea:

.....

27 From its discovery in 1930 until 2006, Pluto was considered the Solar System's ninth planet. In the late 1970s, following the discovery of minor planet 2060 Chiron in the outer Solar System and the recognition of Pluto's very low mass, its status as a major planet began to be questioned. Later, in the early 21st century, many objects similar to Pluto were discovered in the outer Solar System, notably the scattered disc object Eris, which is 27% more massive than Pluto. On August 24, 2006, the International Astronomical Union (IAU) defined the term "planet" for the first time. This definition excluded Pluto as a planet, and added it as a member of the new category "dwarf planet" along with Eris and Ceres. After the reclassification, Pluto was added to the list of minor planets and given the number 134340. Even so, a number of scientists continue to hold that Pluto should be classified as a planet.

http://en.wikipedia.org/wiki/Pluto

topic: .....

topic sentence or main idea:

.....

28 From the age of about twelve until he was seventeen, Newton was educated at The King's School, Grantham (where his signature can still be seen upon a library window sill). He was removed from school, and by October 1659, he was to be found at Woolsthorpe-by-Colsterworth, where his mother, widowed by now for a second time, attempted to make a farmer of him. He hated farming. Henry Stokes, master at the King's School, persuaded his mother to send him back to school so that he might complete his education. Motivated partly by a desire for revenge against a schoolyard bully, he became the top-ranked student.

http://en.wikipedia.org/wiki/Isaac_Newton

topic: .....

cc BY SA

topic sentence or main idea:

.....

29 Chlorofluorocarbons (CFCs) were invented by Thomas Midgley in the 1920s. They were used in air conditioning/cooling units, as aerosol spray propellants prior to the 1980s, and in the cleaning processes of delicate electronic equipment. They also occur as by-products of some chemical processes. No significant natural sources have ever been identified for these compounds — their presence in the atmosphere is due almost entirely to human manufacture. When such ozone-depleting chemicals reach the stratosphere, they are dissociated by ultraviolet light to release chlorine atoms. The chlorine atoms act as a catalyst, and each can break down tens of thousands of ozone molecules before being removed from the stratosphere. Given the longevity of CFC molecules, recovery times are measured in decades. It is calculated that a CFC molecule takes an average of 15 years to go from the ground level up to the upper atmosphere, and it can stay there for about a century, destroying up to one hundred thousand ozone molecules during that time.

http://en.wikipedia.org/wiki/Ozone_depletion

topic: .....

topic sentence or main idea:

.....

30 Around sunset and sunrise the Martian sky is pinkish-red in color, but in the vicinity of the setting sun it is blue. This is the exact opposite of the situation on Earth. However, during the day the sky is a yellow-brown "butterscotch" color. On Mars, Rayleigh scattering is usually a very small effect. It is believed that the color of the sky is caused by the presence of 1% by volume of magnetite in the dust particles. Twilight lasts a long time after the Sun has set and before it rises, because of all the dust in Mars's atmosphere. At times, the Martian sky takes on a violet color, due to scattering of light by very small water ice particles in clouds.

http://en.wikipedia.org/wiki/Astronomy_on_Mars

topic: .....

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topic sentence or main idea:

.....

2.2 Logical Connectors

What is a logical connector?

A logical connector is a word or phrase that connects two ideas and shows the relationship between the two ideas. Logical connectors are also known as signal words because they signal the relationship of the ideas to the reader.

What kinds of logical connectors are there?

There are four basic types of logical connectors: coordinating conjunctions, subordinating conjunctions, sentence conjunctions, and prepositions.

Coordinating conjunctions

Coordinating conjunctions are also called coordinators. A coordinating conjunction connects two or more words, phrases or independent clauses of equal importance within a sentence. The most common coordinating conjunctions are *for*, *and*, *not*, *but*, *or*, *yet*, and *so*. (If you wish, you can remember these seven common coordinating conjunctions by their acronym, FANBOYS).

Example:

Halley's Comet or Comet Halley is the best-known of the short-period comets, and is visible from Earth every 75 to 76 years.

The first coordinating conjunction in the sentence above is *or*. *Or* can be used to show an alternative, a condition, a contrast, or an effect. In the case above, it shows an alternative. (Halley's Comet is also known as Comet Halley). The second coordinating conjunction is *and*. *And* can show addition or time. In the sentence above, *and* shows addition, and tells us that the two clauses (Halley's Comet is the best-known of the short-period comets. Halley's Comet is visible from Earth every 75 to 76 years) are of equal importance.

Subordinating conjunctions

Subordinating conjunctions are also called subordinators. A subordinating conjunction connects an independent clause to a dependant clause. A subordinating conjunction always comes before the dependent clause. Examples of subordinating conjunctions are *after*, *before*, *even though*, *if*, *since*, *though*, and *unless*. (For more examples, see Appendix 8.3).

Example: Peaches are considered self-fertile because a commercial crop can

be produced without cross-pollination, though cross-pollination usually gives a better crop.

In the example above, the first subordinating conjunction *because* is used to show cause. It shows the reason why peaches are considered self-fertile. The second subordinating conjunction is *though*. *Though* is used to show the contrast between self-pollinated peaches and cross-pollinated peaches.

Sentence conjunctions

Sentence conjunctions are also called sentence connectors. A sentence conjunction connects two sentences and shows the relationship between the ideas of the two sentences. Examples of sentence conjunctions are *alternatively*, *consequently*, *eventually*, *furthermore*, *in summary*, *likewise*, and *nevertheless*. (For more examples, see Appendix 8.3).

Example: Galileo reported that stars appeared as mere blazes of light, essentially unaltered in appearance by the telescope, and contrasted them to planets which the telescope revealed to be disks. However, in later writings he described the stars as also being disks, whose sizes he measured. According to Galileo, stellar disk diameters typically measured a tenth the diameter of the disk of Jupiter (one five-hundredth the diameter of the sun), although some were somewhat larger and others substantially smaller.

In the example above, the sentence conjunction is *however*. The function of *however* is to show contrast. In the first sentence, Gallileo reported that stars were blazes of light and seemingly without shape. *However* introduces the second sentence and expresses the contrast; In Galileo's later writings he reported that stars had shape and also size.

Prepositions

A preposition introduces a noun or a noun phrase and occurs within a sentence or clause. The function of a preposition is to illustrate the relationship between the object of the prepositional phrase and the other words of the clause or sentence. Some common prepositions are *after*, *as a result of*, *besides*, *contrary to*, *like*, *prior to*, and *regardless of*. (For more examples, see Appendix 8.3).

Example: For most smaller species of dolphin, only a few larger species of shark such as the bull shark, dusky shark, tiger shark and great white shark are a potential risk, especially for calves.

In the example above, the preposition is *such as*. The function of such as is to show an example. In this case the examples of potential risk to dolphins are bull sharks, dusky sharks, tiger sharks, and great white sharks.

2.2 Logical Connectors

Functions of logical connectors

addition	alternative	cause	clarification
comparison	condition	contrast	effect
emphasis	example	purpose	sequence
summary	time		

For more information about the functions of logical connectors, see Appendix 8.3.

Example

Read the paragraphs below. What are the functions of the highlighted logical connectors? What is the topic? What is the main idea? Write the main idea as a question that the paragraph answers.

Optical fiber can be used **as** a medium **for** telecommunication **because** it is flexible **and** can be bundled **as** cables. It is especially advantageous **for** long-distance communications **because** light propagates through the fiber with little attenuation compared to electrical cables. This allows long distances to be spanned with few repeaters. **Additionally**, the per-channel light signals propagating in the fiber have been modulated at rates as high as 111 gigabits per second by NTT, **although** 10 or 40 Gb/s is typical in deployed systems.

http://en.wikipedia.org/wiki/Fiber-optic_communication

logical connector	function
as	purpose
for	purpose
because	cause
and	addition
as	purpose
for	purpose
because	cause
additionally	addition
although	contrast

Topic: optical fiber

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Main idea as a question: Why can optical fiber be used as a medium for telecommunication?

Exercise

1 Generally, dolphins sleep with only one brain hemisphere in slow-wave sleep at a time, **thus** maintaining enough consciousness to breathe **and** to watch for possible predators **and** other threats. Earlier sleep stages can occur simultaneously in both hemispheres. In captivity, dolphins seemingly enter a fully asleep state where both eyes are closed **and** there is no response to mild external stimuli. Respiration is automatic; a tail kick reflex keeps the blowhole above the water if necessary. Anesthetized dolphins initially show a tail kick reflex. **Though** a similar state has been observed with wild sperm whales, it is not known **if** dolphins in the wild reach this state. The Indus river dolphin has a different sleep method from other dolphin species. Living in water with strong currents **and** potentially dangerous floating debris, it must swim continuously to avoid injury. **As a result**, this species sleeps in very short bursts which last between 4 and 60 seconds.

http://en.wikipedia.org/wiki/Dolphin

logical connector	function
thus	
and	
and	
and	
though	
if	
and	
as a result	

Topic: .....

Main idea as a question:

.....

2 Zinc-64 is an isotope of zinc. It makes up 48.3% of the zinc naturally occurring, **despite the fact that** it is radioactive. Zinc-64 has an exceptionally long half-life of over 2300 million billion years, much longer than the age of the Universe, **and** is, over all reasonable time periods, stable.

http://www.ask.com/wiki/Zinc-64

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logical connector	function
despite the fact that	
and	

Topic: .....

Main idea as a question:

.....

3 Karachi features an arid climate, **albeit** a more moderate version of an arid climate. Karachi is located on the coast **and as a result** has a relatively mild climate. The level of precipitation is low for most of the year. **However**, due to the city's proximity to the sea, humidity levels usually remain high throughout the year. The city enjoys mild winters **and** warm summers. Karachi **also** receives the tail end of the monsoon rains. **Since** summer temperatures (the end of April through the end of August) are approximately 30 to 35 degrees Celsius, the winter months (November through March) are the best time to visit Karachi.

http://en.wikipedia.org/wiki/Climate_of_Karachi

logical connector	function
albeit	
and as a result	
however	
and	
also	
since	

Topic: .....

Main idea as a question:

.....

4 Mars is the fourth planet from the Sun in the Solar System. The planet is named after Mars, the Roman god of war. It is **also** referred to **as** the "Red Planet" **because of** its reddish appearance, **due to** iron oxide prevalent on its surface. Mars is a terrestrial planet with a thin atmosphere, having surface features reminiscent **both** of the impact craters of the Moon **and** the volcanoes, valleys, deserts and polar ice caps of Earth. **Unlike** the Earth, Mars is now a geologically inactive planet with no known tectonic activity. It is the site of Olympus Mons,

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the highest known mountain in the Solar System, **and** of Valles Marineris, the largest canyon. **In addition** to its geographical features, Mars' rotational period and seasonal cycles are **likewise** similar to those of the Earth.

http://en.wikipedia.org/wiki/Mars

logical connector	function
also	
as	
because of	
due to	
both ... and ...	
unlike	
and	
in addition	
likewise	

Topic: .....

Main idea as a question:

.....

5 Sponges are known for regenerating from fragments that are broken off, **although** this only works **if** the fragments include the right types of cells. A few species reproduce by budding. **When** conditions deteriorate, **for example as** temperatures drop, many freshwater species **and** a few marine ones produce gemmules, "survival pods" of unspecialized cells that remain dormant **until** conditions improve **and then either** form completely new sponges **or** recolonize the skeletons of their parents.

http://en.wikipedia.org/wiki/Sponge

logical connector	function
although	
if	
when	
for example	
as	
and	
until	

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and then	
either ... or	

Topic: .....

Main idea as a question:

.....

6 **Despite** Edison's contempt for capital punishment, the war against AC led him to become involved in the development **and** promotion of the electric chair (using AC current) **as** an attempt to portray AC to have greater lethal potential than DC. Edison went on to carry out a brief but intense campaign to ban the use of AC **or** to limit the allowable voltage **for** safety purposes. **As** part of this campaign, Edison's employees publicly electrocuted animals to demonstrate the dangers of AC; AC electric currents are slightly more dangerous **in that** frequencies near 60 Hz have a markedly greater potential for inducing fatal heart attacks than do DC currents. On one of the more notable occasions, in 1903, Edison's workers electrocuted Topsy the elephant at Luna Park, near Coney Island, **after** she had killed several men **and** her owners wanted her put to death. His company filmed the electrocution.

http://en.wikipedia.org/wiki/Thomas_Edison

logical connector	**function**
despite	
and	
as	
or	
for	
as	
in that	
after	
and	

Topic: .....

Main idea as a question:

.....

7 Chemical classification systems attempt to classify elements **or** compounds

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according to certain chemical functional **or** structural properties. **Whereas** the structural properties are largely intrinsic, functional properties **and** the derived classifications depend to a certain degree on the type of chemical interaction partners on which the function is exerted. Sometimes other criteria **like** purely physical ones (**e.g.** molecular weight) **or** - **on the other hand** - functional properties above the chemical level are **also** used for building chemical taxonomies.

http://en.wikipedia.org/wiki/Chemical_classification

logical connector	function
or	
or	
whereas	
and	
like	
e.g.	
or	
on the other hand	
also	

Topic: .....

Main idea as a question:

.....

8 The Internet Protocol Suite (commonly known **as** TCP/IP), **like** many protocol suites, may be viewed **as** a set of layers. Each layer solves a set of problems involving the transmission of data, **and** provides a well-defined service to the upper layer protocols based on using services from some lower layers. Upper layers are logically closer to the user **and** deal with more abstract data, relying on lower layer protocols to translate data into forms that can **eventually** be physically transmitted.

http://en.wikipedia.org/wiki/Internet_Protocol_Suite

logical connector	function
as	
like	
as	
and	

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and	
eventually	

Topic: .....

Main idea as a question:

.....

9 **Prior to** the 20th century, **and also** into its early decades, the pace of discovery of new species of bird was fast; during this period, with numerous collecting expeditions into species-rich areas not previously visited by western ornithologists, up to several hundred new species per decade were being described. **Since then**, the pace has slowed, **and** new species are generally only being found in remote areas, **or** among cryptic **or** secretive groups of species. **Nonetheless**, several tens of species were described for the first time **during** the 1990s.

http://en.wikipedia.org/wiki/Bird_species_new_to_science

logical connector	**function**
prior to	
and also	
since then	
and	
or	
or	
nonetheless	
during	

Topic: .....

Main idea as a question:

.....

10 A cloud is a visible mass of droplets, **in other words**, little drops of water or frozen crystals suspended in the atmosphere above the surface of the Earth **or** another planetary body. A cloud is **also** a visible mass attracted by gravity, **such as** masses of material in space called interstellar clouds **and** nebulae. Clouds are studied in the nephology **or** cloud physics branch of meteorology.

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http://en.wikipedia.org/wiki/Cloud

logical connector	function
in other words	
or	
also	
such as	
and	
or	

Topic: .....

Main idea as a question:

.....

11 Electricity is by its nature difficult to store **and** has to be available on demand. **Consequently**, **unlike** other products, it is not possible, under normal operating conditions, to keep it in stock, ration it or have customers queue for it. **Furthermore**, demand and supply vary continuously. **Therefore**, there is a physical requirement for a controlling agency, the transmission system operator, to coordinate the dispatch of generating units to meet the expected demand of the system across the transmission grid. **If** there is a mismatch between supply **and** demand, the generators speed up **or** slow down, causing the system frequency (**either** 50 **or** 60 hertz) to increase **or** decrease. **If** the frequency falls outside a predetermined range, the system operator will act to add **or** remove **either** generation **or** load.

http://en.wikipedia.org/wiki/Electricity_market

logical connector	function
and	
consequently	
unlike	
furthermore	
therefore	
if	
and	
or	
either ... or ...	
or	

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if	
or	
either ... or ...	

Topic: .....

Main idea as a question:

.....

12 Genome projects are scientific endeavours that **ultimately** aim to determine the complete genome sequence of an organism (be it an animal, a plant, a fungus, a bacterium, an archaean, a protist **or** a virus). The genome sequence for any organism requires the DNA sequences for each of the chromosomes in an organism to be determined. For bacteria, which usually have just one chromosome, a genome project will aim to map the sequence of that chromosome. Humans, with 22 pairs of autosomes and 2 sex chromosomes, will require 46 separate chromosome sequences **in order to** represent the completed genome.

http://en.wikipedia.org/wiki/Genome_project

logical connector	**function**
ultimately	
or	
in order to	

Topic: .....

Main idea as a question:

.....

13 **As** Roman imperial authority effectively ended in the West **during** the 5th century, Western Europe entered the Middle Ages with great difficulties that affected the continent's intellectual production dramatically. Most classical scientific treatises of classical antiquity written in Greek were unavailable, leaving only simplified summaries and compilations. **Notwithstanding**, with the beginning of the Renaissance of the 12th century, interest in natural investigation was renewed. Science developed in this golden period of Scholastic philosophy focused on logic **and** advocated empiricism, perceiving nature **as** a coherent system of laws that could be explained in the light of reason. With this view the medieval men of science went in search of explanations for the phenomena of the universe **and** achieved important advances in areas **such**

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as scientific methodology **and** physics, among many others. These advances, **however**, were suddenly interrupted by the Black Plague **and** are virtually unknown to the lay public of today, partly **because** most theories advanced in medieval science are today obsolete, and partly **because of** the stereotype of Middle Ages as supposedly "Dark Ages".

http://en.wikipedia.org/wiki/Science_in_Medieval_Western_Europe

logical connector	function
as	
during	
notwithstanding	
and	
as	
and	
such as	
and	
however	
and	
because	
because of	

Topic: .....

Main idea as a question:

.....

14 Protein–protein interactions involve **not only** the direct-contact association of protein molecules **but also** longer range interactions through the electrolyte, aqueous solution medium surrounding neighbor hydrated proteins over distances from less than one nanometer to distances of several tens of nanometers. **Furthermore**, such protein–protein interactions are thermodynamically linked functions of dynamically bound ions **and** water that exchange rapidly with the surrounding solution by comparison with the molecular tumbling rate (or correlation times) of the interacting proteins. Protein associations are **also** studied from the perspectives of biochemistry, quantum chemistry, molecular dynamics, signal transduction and other metabolic or genetic/epigenetic networks. **Indeed**, protein–protein interactions are at the core of the entire interactomic system of any living cell.

http://en.wikipedia.org/wiki/Protein–protein_interaction

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logical connector	function
not only... but also	
furthermore	
and	
also	
indeed	

Topic: .....

Main idea as a question:

.....

15 **Although** procedures vary from one field of inquiry to another, identifiable features distinguish scientific inquiry from other methodologies of knowledge. Scientific researchers propose hypotheses **as** explanations of phenomena, **and** design experimental studies to test these hypotheses. These steps must be repeatable **in order to** dependably predict any future results. Theories that encompass wider domains of inquiry may bind many independently-derived hypotheses together in a coherent, supportive structure. This in turn may help form new hypotheses **or** place groups of hypotheses into context.

http://en.wikipedia.org/wiki/Scientific_method

logical connector	function
although	
as	
and	
in order to	
or	

Topic: .....

Main idea as a question:

.....

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2.3 Text Organization Structures

What does text organization mean?

In the previous unit, you learned that logical connectors connect ideas and show the relationship between these ideas. Logical connectors can connect ideas within a sentence and between sentences. Even a single sentence can have several logical connectors to show the relationships between ideas within a sentence. Understanding these sentences is an important skill in reading. However, in order to understand the overall message of a text, we need to be aware of how the sentences and paragraphs are organized. How these sentences and paragraphs are arranged and presented, the pattern of organization, is what we usually refer to as text organization, but it can also mean the organization of even larger texts such as chapters and books.

How can I recognize the pattern of text organization?

One way to recognize the pattern of organization of a paragraph is to locate the topic sentence. The topic sentence will tell you the topic and main idea, and from this it may be possible to anticipate the type of pattern of organization of the paragraph. Another way to recognize the pattern of a text, either a paragraph or longer, is to focus on the logical connectors which show the relationships between the ideas. These logical connectors, together with other key phrases, are sometimes called signal words because they signal to the reader how the ideas relate. These signal words will also indicate the pattern of organization of the text.

What are signal words?

Signal words are logical connectors and other phrases which signal to the reader the organization of the text and the relationships of the ideas. Signal words include coordinating conjunctions such as *and* or *but*, subordinating conjunctions such as *albeit* or *because*, prepositions such as *as a result of* or *because of*, and sentence conjunctions such as *accordingly* or *by and large*. (For more information about the functions of logical connectors, see Appendix 8.3). Signal words include other phrases which are not logical connectors, but nonetheless help to show the structure of the text.

What types of text structure are there?

There are six kinds of text structure that you will usually find in scientific texts. They are:

1) *Definition* - This pattern of text organization is common in science textbooks. The first sentence will often be a topic sentence, and the rest of the paragraph, or paragraphs, will elaborate with examples or details.

2) *Classification or Enumeration* **-** For this type of organization, the subject is classified into items or groups, or ordered as a list. These

groups are of equal value and the order in which they are presented is of no importance.

3) *Comparison and Contrast* **-** The purpose of this type of text is to show the similarities (comparison) or differences (contrast) between two or more things.

4) *Time Order or Sequence* **-** Time order or sequence texts show how a series of events relate to time or order, and are organized in sequence or the order in which they happen. You may see this pattern of organization if you are reading a biography of a famous person, for example. In science texts, you will probably see this pattern of organization if you are reading about a process such as how to conduct an experiment.

5) *Cause and Effect* **-** Cause and effect texts refer to the causal relationships of events or processes. Cause and effect is a very common type of pattern of organization in scientific texts because many scientists are interested in understanding the causes and effects of natural phenomena.

6) *Complex* **-** Complex text organization refers to any text which has a mixture of two or more patterns of organization.

Signal words and text structure

Here is a list of signal words that will help you to identify the text structure: (Words in bold are Academic Word List words).

1) *Definition*

is called	is characterized by	is concerned with	concerns
is **defined** as	**denotes**	describes	**indicates**
involves	is	is known as	means
refers to	stands for	term	

2) *Classification or Enumeration*

1 (one)	2 (two)	3 (three)	also
another	**categories**	**categorize**	classes
consists of	**constitutes**	**distinct**	divided into
element(s)	**factor(s)**	finally	first
includes	kind(s)	lastly	many

most	number	other(s)	second
several	some	third	type(s)

3) *Comparison*

alike	also	as ... as	both
common	comparable	equally	**equivalent**
identical	in the same way	like	**likewise**
parallel	resembles	same	**similar**
similarities	**similarity**	**similarly**	

Contrast

...er	admittedly	after all	**albeit**
alternatively	although	but	**contradict**
contrary	**contrast**	**conversely**	**despite**
difference	different	**differentiate**	differs from
discriminate	**distinction**	distinguish	even so
even though	however	in spite of	instead
less	more	**nevertheless**	**nonetheless**
notwithstanding	on the other hand	opposed to	rather than
regardless	still	though	unlike
whereas	while	yet	

4) *Time Order or Sequence*

after	at *time*	before	begin
by	**conclude**	during	(in the) end
eventually	final(ly)	first	for
from	in *month*, *year*	in turn	**initially**
last(ly)	later	meanwhile	next
now	on *date*	once	originally
period	**prior** (to)	process	second
sequence	since	so far	(as) soon (as)
stage(s)	start	step(s)	**subsequently**
then	till	time	**ultimately**
up to	when	whenever	

5) *Cause*

(on) account (of)	as	because	by
cause	is caused by	**consequence**	due to
in that	in view of	inasmuch as	now that
reason(s)	results from	since	works by

Effect

effect	gives rise to	(the) result	results in
so (that)	**thereby**	therefore	thus

2.3 Text Organization Structures

Exercise

Read the texts below. What is the topic and main idea for each text? What are the signal words, and therefore, what is the pattern of organization of the text?

Example

Aspirin **causes** several different **effects** in the body, mainly the reduction of inflammation, analgesia (relief of pain), and the prevention of clotting, and the reduction of fever. Much of this is believed to be **due to** decreased production of prostaglandins and thromboxanes. Aspirin's ability to suppress the production of prostaglandins and thromboxanes is **due to** its irreversible inactivation of the cyclooxygenase (COX) enzyme. Cyclooxygenase is required for prostaglandin and thromboxane synthesis. Aspirin acts as an acetylating agent where an acetyl group is covalently attached to a serine residue in the active site of the COX enzyme. This makes aspirin different from other NSAIDs (such as diclofenac and ibuprofen), which are reversible inhibitors. However, other **effects** of aspirin, such as uncoupling oxidative phosphorylation in mitochondria, and the modulation of signaling through NF-κB, are also being investigated.

http://en.wikipedia.org/wiki/Aspirin

Topic: aspirin

Main idea: What are the effects of aspirin in the body?

Text structure: cause and effect

1 Units of measure are not limited to physical categories. Examples of physical categories are: linear measure, area, volume, mass, velocity, time duration. Examples of non-physical categories are: currency, quality indicator, color intensity.

http://en.wikipedia.org/wiki/Dimension_(metadata)

Topic: .....

Main idea: .....

Text structure: .....

2 While the term "backcountry" is roughly comparable to the term "wilderness",

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they are not necessarily equivalent. "Wilderness" implies more the condition whereas "backcountry" implies more the position. Backcountry is similar to hinterland. There is some debate about the accessibility of people by means other than human power. While wilderness is a state of mind that implies pristine and untouched landscapes, backcountry serves as areas of land explored exclusively by human power. Wilderness exists in many places, including the backcountry.

http://en.wikipedia.org/wiki/Backcountry

Topic: .....

Main idea: .....

Text structure: .....

3 All mammals except the monotremes, the xenarthrans, the pangolins, and the cetaceans have up to four distinct types of teeth, with a maximum number for each. These are the incisor (cutting), the canine, the premolar, and the molar (grinding). Mammals that have distinct types of teeth are heterodont; others are homodont.

http://en.wikipedia.org/wiki/Dentition

Topic: .....

Main idea: .....

Text structure: .....

4 The greenhouse effect is caused by an atmosphere containing gases that absorb and emit infrared radiation. Greenhouse gases trap heat within the surface-troposphere system, causing heating at the surface of the planet or moon. This mechanism is fundamentally different from that of an actual greenhouse, which works by isolating warm air inside the structure so that heat is not lost by convection. The greenhouse effect was discovered by Joseph Fourier in 1824, first reliably experimented on by John Tyndall in 1858, and first reported quantitatively by Svante Arrhenius in 1896.

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http://en.wikipedia.org/wiki/Greenhouse_effect

Topic: .....

Main idea: .....

Text structure: .....

5 The beginning of the 20th century brought the start of a revolution in physics. The long-held theories of Newton were shown not to be correct in all circumstances. Beginning in 1900, Max Planck, Albert Einstein, Niels Bohr and others developed quantum theories to explain various anomalous experimental results, by introducing discrete energy levels. Not only did quantum mechanics show that the laws of motion did not hold on small scales, but even more disturbingly, the theory of general relativity, proposed by Einstein in 1915, showed that the fixed background of spacetime, on which both Newtonian mechanics and special relativity depended, could not exist. In 1925, Werner Heisenberg and Erwin Schrödinger formulated quantum mechanics, which explained the preceding quantum theories. The observation by Edwin Hubble in 1929 that the speed at which galaxies recede positively correlates with their distance, led to the understanding that the universe is expanding, and the formulation of the Big Bang theory by Georges Lemaître.

http://en.wikipedia.org/wiki/History_of_science

Topic: .....

Main idea: .....

Text structure: .....

6 The two most important types of spacetime singularities are curvature singularities and conical singularities. Singularities can also be divided according to whether they are covered by an event horizon or not (naked singularities). According to general relativity, the initial state of the universe, at the beginning of the Big Bang, was a singularity. Another type of singularity predicted by general relativity is inside a black hole: any star collapsing beyond a certain point would form a black hole, inside which a singularity (covered by an event horizon) would be formed, as all the matter would flow into a certain point (or a circular line, if the black hole is rotating). These singularities are also known as curvature singularities.

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http://en.wikipedia.org/wiki/Gravitational_singularity

Topic: .....

Main idea: .....

Text structure: .....

7 Ocean Engineering is an ambiguously defined discipline, but may refer to Oceanographic Engineering, a term describing marine electronics engineering applied to supporting the work of oceanographers; or, may refer to offshore engineering, or maritime engineering, which is the branch of engineering allied to civil engineering, and concerned with the technical aspects of fixed and floating offshore marine structures and systems related to harnessing ocean resources. These include offshore oil and gas and the rapidly expanding area of ocean renewable energy, as well as other ocean resource activities such as sub-sea mining and aquaculture.

http://en.wikipedia.org/wiki/Ocean_engineering

Topic: .....

Main idea: .....

Text structure: .....

8 Microorganisms are very diverse; they include bacteria, fungi, archaea, and protists; microscopic plants (called green algae); and animals such as plankton and the planarian. Some microbiologists also include viruses, but others consider these as non-living. Most microorganisms are unicellular (single-celled), but this is not universal, since some multicellular organisms are microscopic, while some unicellular protists and bacteria, like Thiomargarita namibiensis, are macroscopic and visible to the naked eye.

http://en.wikipedia.org/wiki/Microorganism

Topic: .....

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Main idea: .....

Text structure: .....

9 The sunlit sky appears blue because air scatters short-wavelength light more than longer wavelengths. Since blue light is at the short wavelength end of the visible spectrum, it is more strongly scattered in the atmosphere than long wavelength red light. The result is that the human eye perceives blue when looking toward parts of the sky other than the sun. Near sunrise and sunset, most of the light we see comes in nearly tangent to the Earth's surface, so that the light's path through the atmosphere is so long that much of the blue and even green light is scattered out, leaving the sun rays and the clouds it illuminates red. Therefore, when looking at the sunset and sunrise, you will see the color red more than any of the other colors.

http://en.wikipedia.org/wiki/Diffuse_sky_radiation

Topic: .....

Main idea: .....

Text structure: .....

10 A binary star is a star system consisting of two stars orbiting around their common center of mass. The brighter star is called the primary and the other is its companion star, or secondary. Research between the early 1800s and today suggests that many stars are part of either binary star systems or star systems with more than two stars, called multiple star systems. The term double star may be used synonymously with binary star, but more generally, a double star may be either a binary star or an optical double star which consists of two stars with no physical connection but which appear close together in the sky as seen from the Earth. A double star may be determined to be optical if its components have sufficiently different proper motions or radial velocities, or if parallax measurements reveal its two components to be at sufficiently different distances from the Earth. Most known double stars have not yet been determined to be either bound binary star systems or optical doubles.

http://en.wikipedia.org/wiki/Binary_star

Topic: .....

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Main idea: .....

Text structure: .....

11 Although Mars is smaller (11% by mass) and 50% further away from the Sun than the Earth, its climate has important similarities, such as the polar ice caps, seasonal changes and the observable presence of weather patterns. It has attracted sustained study from planetologists and climatologists. Although Mars's climate has similarities to Earth's, including seasons and periodic ice ages, there are also important differences such as the absence of liquid water (though frozen water exists) and much lower thermal inertia. Mars' atmosphere has a scale height of approximately 11 km (36,000 ft), 60% greater than that on Earth. The climate is of considerable relevance to the question of whether life is or was present on the planet, and briefly received more interest in the news due to NASA measurements indicating increased sublimation of the south polar icecap leading to some popular press speculation that Mars was undergoing a parallel bout of global warming.

http://en.wikipedia.org/wiki/Climate_of_Mars

Topic: .....

Main idea: .....

Text structure: .....

12 In somatic cell nuclear transfer, the nucleus, which contains the organism's DNA, of a somatic cell (a body cell other than a sperm or egg cell) is removed and the rest of the cell discarded. At the same time, the nucleus of an egg cell is removed. The nucleus of the somatic cell is then inserted into the enucleated egg cell. After being inserted into the egg, the somatic cell nucleus is reprogrammed by the host cell. The egg, now containing the nucleus of a somatic cell, is stimulated with a shock and will begin to divide. After many mitotic divisions in culture, this single cell forms a blastocyst (an early stage embryo with about 100 cells) with almost identical DNA to the original organism.

http://en.wikipedia.org/wiki/Somatic_cell_nuclear_transfer

Topic: .....

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Main idea: .....

Text structure: .....

13 The arms of orangutans are twice as long as their legs. Much of the arm's length has to do with the length of the radius and the ulna rather than the humerus. Their fingers and toes are curved, allowing them to better grip onto branches. Orangutans have less restriction in the movements of their legs than humans and other primates, due to the lack of a hip joint ligament which keeps the femur held into the pelvis. Unlike gorillas and chimpanzees, orangutans are not true knuckle-walkers, and are instead fist-walkers.

http://en.wikipedia.org/wiki/Orangutan

Topic: .....

Main idea: .....

Text structure: .....

14 Predation in its zoological sense is the killing and consumption of another organism, which excludes bacteria and parasites from the apex predator concept. Predation has been defined in this sense since 1932. The apex predator concept is commonly applied in wildlife management and conservation, as well as eco-tourism. In these contexts it has been defined in terms of trophic levels. Trophic levels are "hierarchical strata of a food web characterized by organisms which are the same number of steps removed from the primary producers." Primary, secondary, tertiary, and higher level consumers occupy successive trophic levels. One study of marine food webs defined apex predators as greater than trophic level four.

http://en.wikipedia.org/wiki/Apex_predator

Topic: .....

Main idea: .....

Text structure: .....

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15 Wolves differ from domestic dogs in a more varied nature. Anatomically, wolves have smaller orbital angles than dogs (over 53 degrees for dogs, under 45 degrees for wolves) and a comparatively larger brain capacity. Larger paw size, yellow eyes, longer legs, and bigger teeth further distinguish adult wolves from other canids, especially dogs. Also, a supracaudal gland is present at the base of the tail in wolves but not in many dogs.

http://en.wikipedia.org/wiki/Gray_wolf

Topic: .....

Main idea: .....

Text structure: .....

16 The Cretaceous–Tertiary extinction event, which occurred approximately 65.5 million years ago (Ma), was a large-scale mass extinction of animal and plant species in a geologically short period of time. Widely known as the K–T extinction event, it is associated with a geological signature known as the K–T boundary, usually a thin band of sedimentation found in various parts of the world. K is the traditional abbreviation for the Cretaceous Period derived from the German name Kreidezeit, and T is the abbreviation for the Tertiary Period (a historical term for the period of time now covered by the Paleogene and Neogene periods). The event marks the end of the Mesozoic Era and the beginning of the Cenozoic Era. With "Tertiary" being discouraged as a formal time or rock unit by the International Commission on Stratigraphy, the K–T event is now called the Cretaceous–Paleogene (or K–Pg) extinction event by many researchers.

Topic: .....

Main idea: .....

Text structure: .....

17 Comparisons between the Microsoft Windows and Linux computer operating systems are a common topic of discussion among their users. Currently, Windows is the dominant proprietary operating system for personal desktop use (in terms of desktop installations), while Linux is the most prominent free software operating system. Both operating systems not only compete for user base in the personal computer market but are also rivals in the server and

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embedded systems markets.

http://en.wikipedia.org/wiki/Comparison_of_Windows_and_Linux

Topic: .....

Main idea: .....

Text structure: .....

18 Chloroplasts are organelles found in plant cells and other eukaryotic organisms that conduct photosynthesis. Chloroplasts capture light energy to conserve free energy in the form of ATP and reduce NADP to NADPH through a complex set of processes called photosynthesis. The word chloroplast is derived from the Greek words chloros, which means green, and plast, which means form or entity. Chloroplasts are members of a class of organelles known as plastids.

http://en.wikipedia.org/wiki/Chloroplast

Topic: .....

Main idea: .....

Text structure: .....

19 Two kinds of solar time, apparent solar time and mean solar time, are among the three kinds of time that were recognized and measured by astronomers up to the 1950s (the third traditional kind of time being sidereal time, time according to the apparent rotation of the stars). The measures of all these three kinds of time depend on the rotation of the earth. Nowadays both kinds of solar time, along with sidereal time, stand in contrast to newer kinds of time measurement, introduced from the 1950s onwards (starting with ephemeris time), which were designed to be independent of earth rotation.

http://en.wikipedia.org/wiki/Solar_time

Topic: .....

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Main idea: .....

Text structure: .....

20 A Turing machine is a theoretical device that manipulates symbols contained on a strip of tape. Despite its simplicity, a Turing machine can be adapted to simulate the logic of any computer algorithm, and is particularly useful in explaining the functions of a CPU inside of a computer. The "Turing" machine was described by Alan Turing in 1937, who called it an "a(automatic)-machine". Turing machines are not intended as a practical computing technology, but rather as a thought experiment representing a computing machine. They help computer scientists understand the limits of mechanical computation.

http://en.wikipedia.org/wiki/Turing_machine

Topic: .....

Main idea: .....

Text structure: .....

21 The most common perception of a volcano is of a conical mountain, spewing lava and poisonous gases from a crater at its summit. This describes just one of many types of volcano, and the features of volcanoes are much more complicated. The structure and behavior of volcanoes depends on a number of factors. Some volcanoes have rugged peaks formed by lava domes rather than a summit crater, whereas others present landscape features such as massive plateaus. Vents that issue volcanic material (lava, which is what magma is called once it has escaped to the surface, and ash) and gases (mainly steam and magmatic gases) can be located anywhere on the landform. Many of these vents give rise to smaller cones such as Puu Oo on a flank of Hawaii's Kīlauea.

http://en.wikipedia.org/wiki/Volcano

Topic: .....

Main idea: .....

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Text structure: .....

22 Peptides have recently received prominence in molecular biology for several reasons. The first and most important is that peptides allow the creation of peptide antibodies in animals without the need to purify the protein of interest. This involves synthesizing antigenic peptides of sections of the protein of interest. These will then be used to make antibodies in a rabbit or mouse against the protein. Another reason is that peptides have become instrumental in mass spectrometry, allowing the identification of proteins of interest based on peptide masses and sequence. In this case the peptides are most often generated by in-gel digestion after electrophoretic separation of the proteins. Finally, peptides have recently been used in the study of protein structure and function. For example, synthetic peptides can be used as probes to see where protein-peptide interactions occur. Inhibitory peptides are also used in clinical research to examine the effects of peptides on the inhibition of cancer proteins and other diseases.

http://en.wikipedia.org/wiki/Peptide

Topic: .....

Main idea: .....

Text structure: .....

23 The DNA content of a cell is duplicated at the start of the cell reproduction process. Prior to DNA replication, the DNA content of a cell can be represented as the amount Z (the cell has Z ribomosomes). After the DNA replication process, the amount of DNA in the cell is 2Z (multiplication: 2 x Z = 2Z). During binary fission and mitosis the duplicated DNA content of the reproducing parental cell is separated into two equal halves that are destined to end up in the two daughter cells. The final part of the cell reproduction process is cell division, when daughter cells physically split apart from a parental cell. During meiosis, there are two cell division steps that together produce the four daughter cells.

http://en.wikipedia.org/wiki/Cell_growth

Topic: .....

Main idea: .....

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Text structure: .....

24 Although photosynthesis can happen in different ways in different species, some features are always the same. For example, the process always begins when energy from light is absorbed by proteins called photosynthetic reaction centers that contain chlorophylls. In plants, these proteins are held inside organelles called chloroplasts, while in bacteria they are embedded in the plasma membrane. Some of the light energy gathered by chlorophylls is stored in the form of adenosine triphosphate (ATP). The rest of the energy is used to remove electrons from a substance such as water. These electrons are then used in the reactions that turn carbon dioxide into organic compounds. In plants, algae and cyanobacteria this is done by a sequence of reactions called the Calvin cycle, but different sets of reactions are found in some bacteria, such as the reverse Krebs cycle in chlorobium. Many photosynthetic organisms have adaptations that concentrate or store carbon dioxide. This helps reduce a wasteful process called photorespiration that can consume part of the sugar produced during photosynthesis.

http://en.wikipedia.org/wiki/Photosynthesis

Topic: .....

Main idea: .....

Text structure: .....

25 The history of thermodynamics as a scientific discipline generally begins with Otto von Guericke who, in 1650, built and designed the world's first vacuum pump and demonstrated a vacuum using his Magdeburg hemispheres. Guericke was driven to make a vacuum in order to disprove Aristotle's long-held supposition that "nature abhors a vacuum". Shortly after Guericke, the Irish physicist and chemist Robert Boyle had learned of Guericke's designs and, in 1656, in coordination with English scientist Robert Hooke, built an air pump. Using this pump, Boyle and Hooke noticed a correlation between pressure, temperature, and volume. In time, Boyle's Law was formulated, which states that pressure and volume are inversely proportional. Then, in 1679, based on these concepts, an associate of Boyle's named Denis Papin built a bone digester, which was a closed vessel with a tightly fitting lid that confined steam until a high pressure was generated.

http://en.wikipedia.org/wiki/Thermodynamics

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Topic: .....

Main idea: .....

Text structure: .....

26 Global warming is the increase in the average temperature of Earth's near-surface air and oceans since the mid-20th century and its projected continuation. Global surface temperature increased 0.74 ± 0.18 °C (1.33 ± 0.32 °F) between the start and the end of the 20th century. The Intergovernmental Panel on Climate Change (IPCC) concludes that most of the observed temperature increase since the middle of the 20th century was very likely caused by increasing concentrations of greenhouse gases resulting from human activity such as fossil fuel burning and deforestation. The IPCC also concludes that variations in natural phenomena such as solar radiation and volcanic eruptions had a small cooling effect after 1950. These basic conclusions have been endorsed by more than 40 scientific societies and academies of science, including all of the national academies of science of the major industrialized countries.

http://en.wikipedia.org/wiki/Global_warming

Topic: .....

Main idea: .....

Text structure: .....

27 In mathematics, an implicit function is a function in which the dependent variable has not been given "explicitly" in terms of the independent variable. To give a function f explicitly is to provide a prescription for determining the output value of the function y in terms of the input value x: $y = f(x)$. By contrast, the function is implicit if the value of y is obtained from x by solving an equation of the form: $R(x,y) = 0$. That is, it is defined as the level set of a function in two variables: one variable or the other may determine the other, but one is not given an explicit formula for one in terms of the other.

http://en.wikipedia.org/wiki/Implicit_and_explicit_functions

Topic: .....

cc BY SA

Main idea: .....

Text structure: .....

28 A skipping tornado is a vaguely defined term which refers to a tornado which has a discontinuous damage path. This may be due to several factors:
1) The tornado actually lifting from the surface (which technically makes the two damage paths separate tornadoes).
2) The tornado passing over a portion of land where there are no structures or vegetation capable of showing damage
3) The tornado temporarily weakening so that the winds are below the damage threshold of the structures or vegetation being affected.

http://en.wikipedia.org/wiki/Skipping_tornado

Topic: .....

Main idea: .....

Text structure: .....

29 Many species of animals use paralyzing toxins in order to capture prey, evade predation, or both. One famous example is the tetrodotoxin of fish species such as Takifugu rubripes, the famously lethal pufferfish of Japanese fugu. This toxin works by binding to sodium channels in nerve cells, preventing the cells' proper function. A non-lethal dose of this toxin results in temporary paralysis. This toxin is also present in many other species ranging from toads to nemerteans. Another interesting use of paralysis in the natural world is the behavior of some species of wasp. In order to complete the reproductive cycle, the female wasp first paralyzes a prey item such as a grasshopper and then places it into her nest. Eggs are then laid on the paralyzed insect, which is devoured by the larvae after they hatch. Many snakes also exhibit powerful neurotoxins that can cause non-permanent paralysis or death.

http://en.wikipedia.org/wiki/Paralysis

Topic: .....

Main idea: .....

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Text structure: .....

30 Historically, galaxies have been categorized according to their apparent shape (usually referred to as their visual morphology). A common form is the elliptical galaxy, which has an ellipse-shaped light profile. Spiral galaxies are disk-shaped assemblages with dusty, curving arms. Galaxies with irregular or unusual shapes are known as peculiar galaxies, and typically result from disruption by the gravitational pull of neighboring galaxies. Such interactions between nearby galaxies, which may ultimately result in galaxies merging, may induce episodes of significantly increased star formation, producing what is called a starburst galaxy. Small galaxies that lack a coherent structure could also be referred to as irregular galaxies.

http://en.wikipedia.org/wiki/Galaxy

Topic: .....

Main idea: .....

Text structure: .....

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3 Word Reading Strategies

1. **Restatements**
2. **Definitions**
3. **Prefixes, roots and suffixes**
4. **Context**

3.1 Restatements

What are restatements?

Restatements are pronouns and other phrases using determiners that are used to replace previous words or phrases within a text.

Why are restatements used?

Restatements are used as a means of establishing cohesion within a text, either by **omitting**, **referring to**, **substituting for**, or **summarizing** previous words, phrases, or sentences. Restatements help to maintain the flow of ideas.

How are pronouns used to make restatements?

Pronouns are words that stand for other words. Pronouns replace subjects, objects or possessives. Pronouns can be used in place of nouns, noun phrases, sentences, paragraphs, or even groups of paragraphs. Pronouns must agree in number (singular or plural) with the word or words that they replace, and like must replace like; a subject pronoun must replace a subject, and an object pronoun must replace an object. The common pronouns of scientific texts are the, it, they, this, that, these, those and which.

Example 1; In typical usage, water refers only to its liquid form or state, but the substance also has a solid state, ice, and a gaseous state, water vapor or steam. Water covers 71% of the Earth's surface. On Earth, it is found mostly in oceans and other large water bodies, with 1.6% of water below ground in aquifers and 0.001% in the air as vapor, clouds (formed of solid and liquid water particles suspended in air), and precipitation.

In this example, "it" refers to "water".

Example 2: Although all penguin species are native to the southern hemisphere, they are not found only in cold climates, such as Antarctica. In fact, only a few species of penguin live so far south. Several species are found in the temperate zone, and one species, the Galápagos Penguin, lives near the equator.

In this example, "they" refers to "penguin species".

How are determiners used to make restatements?

Restatements can also be made by employing pronouns that function as determiners; the, this, that, these, and those.

There are three main ways a writer may use these determiners to make restatements;

1 **Omission**

this / that / these / those *with* **(nothing)**

Omission is used for brevity and style, and when there is no need for repetition.

Example 1; The most prominent feature of the walrus is the long tusks. These are elongated canines, which are present in both sexes and can reach a length of 1 metre and weigh up to 5.4 kilograms.

In this example, "these" refers to "long tusks". "Tusks" is the only plural word of the previous sentence, so there is no ambiguity.

Example 2; There are, however, a number of respects in which the structure of the cerebellum is compartmentalized. There are large compartments that are generally known as zones; these can be decomposed into smaller compartments known as microzones.

In this example, "these" refers to "large compartments that are generally known as zones".

2 **Referral**

the / this / that / these / those *with* **previous noun**

Referral restatements are used for clarity of expression.

Example 1; The strings of string theory are one-dimensional oscillating lines, but they are no longer considered fundamental to the theory, which can be formulated in terms of points or surfaces too.

In this example, "the theory" refers to "string theory".

Example 2; Fossil fuels are fuels formed by natural resources such as anaerobic decomposition of buried dead organisms. The age of the organisms and their resulting fossil fuels is typically millions of years, and sometimes exceeds 650 million years. These fuels contain a high percentage of carbon and hydrocarbons.

In this example, "these fuels" refers to "fossil fuels".

3 **Substitution**

the / this / that / these / those *with* **new noun**

New nouns are employed stylistically to avoid repetition, and to show the semantic relationships between the two words, phrases or ideas.

Example 1; In environments which are potentially lethal to the cell, an amoeba may become dormant by forming itself into a ball and secreting a protective

membrane to become a microbial cyst. The cell remains in this state until it encounters more favorable conditions.

In this example, "this state" refers to "dormancy", or "being dormant".

Example 2; As a motivation technique (usually called Innovation Time Off), all Google engineers are encouraged to spend 20% of their work time (one day per week) on projects that interest them. Some of Google's newer services, such as Gmail, Google News, Orkut, and AdSense originated from these independent endeavors.

In this example, "these independent endeavors" refers to "projects that interest Google engineers"

4 **Summary**

the / this / that / such / these / those *with* **a general word or phrase**

Summary restatements summarize concepts or ideas.

Example 1; For isolated systems, entropy never decreases. This fact has several important consequences in science: first, it prohibits "perpetual motion" machines; and second, it suggests an arrow of time.

In this example, "this fact" refers to "entropy never decreases".

Example 2; Coastal limestones are often eroded by organisms which bore into the rock by various means. This process is known as bioerosion.

In this example, "this process" refers to "Coastal limestones are often eroded by organisms which bore into the rock by various means".

3.1 Restatements

Exercise

Read the texts below. What do the highlighted words refer to?

1 Fossil fuels are fuels formed by natural resources such as anaerobic decomposition of buried dead organisms. The age of the organisms and their resulting fossil fuels is typically millions of years, and sometimes exceeds 650 million years. **These fuels** contain a high percentage of carbon and hydrocarbons.

http://en.wikipedia.org/wiki/Fossil_fuel

Answer: .....

2 Acetic acid, CH3COOH, also known as ethanoic acid, is an organic acid, which gives vinegar its sour taste and pungent smell. **It** is a weak acid, in that it is only a partially dissociated acid in an aqueous solution.

http://en.wikipedia.org/wiki/Acetic_acid

Answer: .....

3 Cancer is fundamentally a disease of regulation of tissue growth. In order for a normal cell to transform into a cancer cell, genes which regulate cell growth and differentiation must be altered. Genetic changes can occur at many levels, from gain or loss of entire chromosomes to a mutation affecting a single DNA nucleotide. There are two broad categories of genes which are affected by **these changes**.

http://en.wikipedia.org/wiki/Cancer

Answer: .....

4 Prolonged intake of flavonol-rich cocoa has been linked to cardiovascular health benefits, though it should be noted that **this** refers to raw cocoa and to a lesser extent, dark chocolate, since flavonoids degrade during cooking and alkalizing processes.

http://en.wikipedia.org/wiki/Cocoa_bean

Answer: .....

5 The state of water on a planet depends on ambient pressure, which is determined by the planet's gravity. If a planet is sufficiently massive, the water on **it** may be solid even at high temperatures, because of the high pressure caused by gravity.

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http://en.wikipedia.org/wiki/Water

Answer: .....

6 Sharks (superorder Selachimorpha) are a type of fish with a full cartilaginous skeleton and a highly streamlined body. The earliest known sharks date from more than 420 million years ago, before the time of the dinosaurs. Since **that time**, sharks have diversified into 440 species, ranging in size from the small dwarf lanternshark, Etmopterus perryi, a deep sea species of only 17 centimeters in length, to the whale shark, Rhincodon typus, the largest fish, which reaches approximately 12 metres and which feeds only on plankton, squid, and small fish through filter feeding.

http://en.wikipedia.org/wiki/Shark

Answer: .....

7 Depression affects 20-30% of people who have dementia, and about 20% have anxiety. Psychosis (often delusions of persecution) and agitation/aggression also often accompany dementia. Each of **these** needs to be assessed and treated independent of the underlying dementia.

http://en.wikipedia.org/wiki/Dementia

Answer: .....

8 It is an almost universal attribute of polyps to reproduce asexually by the method of budding. This mode of reproduction may be combined with sexual reproduction, or may be the sole method by which the polyp produces offspring, in which case the polyp is entirely without sexual organs. In many cases the buds formed do not separate from the parent but remain in continuity with **it**, thus forming colonies or stocks, which may reach a great size and contain a vast number of individuals. Slight differences in the method of budding produce great variations in the form of the colonies. The reef-building corals are polyp-colonies, strengthened by the formation of a firm skeleton.

http://en.wikipedia.org/wiki/Polyp

Answer: .....

9 What "classical physics" refers to depends on the context. When discussing special relativity, **it** refers to the Newtonian physics which preceded relativity, i.e. the branches of physics based on principles developed before the rise of relativity and quantum mechanics. When discussing general relativity, **it** refers to the result of modifying Newtonian physics to incorporate special relativity. When discussing quantum mechanics, **it** refers to non-quantum physics, often including even general relativity. In other words, **it** is the physics preceding the physics of interest in one's discussion.

http://en.wikipedia.org/wiki/Classical_physics

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Answer: .....

10 Both males and females defend the pride against intruders. Some individual lions consistently lead the defense against intruders, while others lag behind. Lions tend to assume specific roles in the pride. Those lagging behind may provide other valuable services to the group. An alternative hypothesis is that there is some reward associated with being a leader who fends off intruders and the rank of lionesses in the pride is reflected in **these responses**.

http://en.wikipedia.org/wiki/Lion

Answer: .....

11 In the heart of lungfish, the septum extends part-way into the ventricle. This allows for some degree of separation between the de-oxygenated bloodstream destined for the lungs and the oxygenated stream that is delivered to the rest of the body. The absence of such a division in living amphibian species may be at least partly due to the amount of respiration that occurs through the skin in **such species**; thus, the blood returned to the heart through the vena cavae is, in fact, already partially oxygenated. As a result, there may be less need for a finer division between the two bloodstreams than in lungfish or other tetrapods.

http://en.wikipedia.org/wiki/Heart

Answer: .....

12 The strength of the depletion zone electric field increases as the reverse-bias voltage increases. Once the electric field intensity increases beyond a critical level, the p–n junction depletion zone breaks-down and current begins to flow, usually by either the Zener or avalanche breakdown processes. Both of **these breakdown processes** are non-destructive and are reversible, so long as the amount of current flowing does not reach levels that cause the semiconductor material to overheat and cause thermal damage.

http://en.wikipedia.org/wiki/P-n_junction

Answer: .....

13 A great deal of research on biological clocks was done in the latter half of the 20th century. It is now known that the molecular circadian clock can function within a single cell; i.e., it is cell-autonomous. At the same time, different cells may communicate with each other resulting in a synchronized output of electrical signaling. **These** may interface with endocrine glands of the brain to result in periodic release of hormones.

http://en.wikipedia.org/wiki/Circadian_rhythm

Answer: .....

14 The first approved drug for the causative treatment of sickle-cell anaemia,

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hydroxyurea, was shown to decrease the number and severity of attacks in a study in 1995 (Charache et al.) and shown to possibly increase survival time in a study in 2003 (Steinberg et al.). **This** is achieved, in part, by reactivating fetal hemoglobin production in place of the hemoglobin S that causes sickle-cell anaemia.

http://en.wikipedia.org/wiki/Sickle-cell_disease

Answer: .....

15 A model organism is a non-human species that is extensively studied to understand particular biological phenomena, with the expectation that discoveries made in the organism model will provide insight into the workings of other organisms. In particular, model organisms are widely used to explore potential causes and treatments for human disease when human experimentation would be unfeasible or unethical. **This strategy** is made possible by the common descent of all living organisms, and the conservation of metabolic and developmental pathways and genetic material over the course of evolution. Studying model organisms can be informative, but care must be taken when generalizing from one organism to another.

http://en.wikipedia.org/wiki/Model_organism

Answer: .....

16 An understanding of the relationship between electricity and magnetism began in 1819 with work by Hans Christian Oersted, a professor at the University of Copenhagen, who discovered more or less by accident that an electric current could influence a compass needle. This landmark experiment is known as Oersted's Experiment. Several other experiments followed, with André-Marie Ampère, Carl Friedrich Gauss, Michael Faraday, and others finding further links between magnetism and electricity. James Clerk Maxwell synthesized and expanded these insights into Maxwell's equations, unifying electricity, magnetism, and optics into the field of electromagnetism. In 1905, Einstein used **these laws** in motivating his theory of special relativity, requiring that the laws held true in all inertial reference frames.

http://en.wikipedia.org/wiki/Magnetism

Answer: .....

17 Several theories have been offered as to why the Spanish flu may have been "forgotten" by historians and the public over so many years. The rapid pace of the pandemic, which killed most of its victims in the United States, for example, within a period of less than nine months, resulted in limited media coverage in a given area. The general population was also familiar with patterns of pandemic disease in the late 19th and early 20th centuries: typhoid, yellow fever, diphtheria, and cholera all occurred near the same time period. **These outbreaks** probably lessened the significance of the influenza pandemic for the public.

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http://en.wikipedia.org/wiki/1918_flu_pandemic

Answer: .....

18 After completing his theory of special relativity, Albert Einstein realized that forces felt by objects undergoing constant proper acceleration are actually feeling themselves being accelerated, so that, for example, a car's acceleration forwards would result in the driver feeling a slight pressure between herself and her seat. In the case of gravity, which Einstein concluded is not actually a force, this is not the case; acceleration due to gravity is not felt by an object in free-fall. **This** was the basis for his development of general relativity, a relativistic theory of gravity.

http://en.wikipedia.org/wiki/Acceleration

Answer: .....

19 Louis de Broglie postulated that all particles with momentum have a wavelength; $\lambda = h/p$, where h is Planck's constant, and p is the magnitude of the momentum of the particle. **This hypothesis** was at the basis of quantum mechanics. Nowadays, this wavelength is called the de Broglie wavelength. For example, the electrons in a CRT display have a de Broglie wavelength of about 10^{-13} m.

http://en.wikipedia.org/wiki/Wave

Answer: .....

(λ is pronounced "lambda". See 8.2 symbols).

20 Computer analysis of viral and host DNA sequences is giving a better understanding of the evolutionary relationships between different viruses and may help identify the ancestors of modern viruses. To date, **such analyses** have not helped to decide on which of these hypotheses are correct. However, it seems unlikely that all currently known viruses have a common ancestor and viruses have probably arisen numerous times in the past by one or more mechanisms.

http://en.wikipedia.org/wiki/Virus

Answer: .....

21 The evolutionary perspective offers an alternative approach to understand what happiness or quality of life is about. Briefly, the questions to be answered are: What features are included in the brain that allows humans to distinguish between positive and negative states of mind, and how do these features improve the survivability of humans? Answering these questions points towards an understanding of what happiness is about and how to best exploit the capacities of the brain with which humans are endowed. **The perspective** is presented in detail by the evolutionary biologist Bjørn Grinde in his book Darwinian Happiness, as well as in a more formal way.

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http://en.wikipedia.org/wiki/Happiness

Answer: .....

22 A supernova (pl. supernovae) is a stellar explosion that is more energetic than a nova. Supernovae are extremely luminous and cause a burst of radiation that often briefly outshines an entire galaxy, before fading from view over several weeks or months. During **this short interval** a supernova can radiate as much energy as the Sun is expected to emit over its entire life span. The explosion expels much or all of a star's material at a velocity of up to 30,000 km/s (a tenth the speed of light), driving a shock wave into the surrounding interstellar medium. This shock wave sweeps up an expanding shell of gas and dust called a supernova remnant.

http://en.wikipedia.org/wiki/Supernova

Answer: .....

23 The human body is anywhere from 55% to 78% water depending on body size. To function properly, the body requires between one and seven liters of water per day to avoid dehydration; the precise amount depends on the level of activity, temperature, humidity, and other factors. Most of this is ingested through foods or beverages other than drinking straight water. It is not clear how much water intake is needed by healthy people, though most advocates agree that 6–7 glasses of water (approximately 2 liters) daily is the minimum to maintain proper hydration. Medical literature favors a lower consumption, typically 1 liter of water for an average male, excluding extra requirements due to fluid loss from exercise or warm weather. For **those** who have healthy kidneys, it is rather difficult to drink too much water, but (especially in warm humid weather and while exercising) it is dangerous to drink too little. People can drink far more water than necessary while exercising, however, putting them at risk of water intoxication (hyperhydration), which can be fatal. The "fact" that a person should consume eight glasses of water per day cannot be traced back to a scientific source. There are other myths such as the effect of water on weight loss and constipation that have been dispelled.

http://en.wikipedia.org/wiki/Water

Answer: .....

24 A major impact of desertification is biodiversity loss and loss of productive capacity, for example, by transition from land dominated by shrublands to non-native grasslands. In the semi-arid regions of southern California, many coastal sage scrub and chaparral ecosystems have been replaced by non-native, invasive grasses due to the shortening of fire return intervals. **This** can create a monoculture of annual grass that cannot support the wide range of animals once found in the original ecosystem. In Madagascar's central highland plateau, 10% of the entire country has been lost to desertification due to slash and burn agriculture by indigenous peoples.

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http://en.wikipedia.org/wiki/Desertification

Answer: .....

25 One characteristic of Java is portability, which means that computer programs written in the Java language must run similarly on any supported hardware/operating-system platform. **This** is achieved by compiling the Java language code to an intermediate representation called Java bytecode, instead of directly to platform-specific machine code. Java bytecode instructions are analogous to machine code, but are intended to be interpreted by a virtual machine (VM) written specifically for the host hardware. End-users commonly use a Java Runtime Environment (JRE) installed on their own machine for standalone Java applications, or in a Web browser for Java applets.

http://en.wikipedia.org/wiki/Java_(programming_language)

Answer: .....

26 A genetically modified organism (GMO) or genetically engineered organism (GEO) is an organism whose genetic material has been altered using genetic engineering techniques. These techniques, generally known as recombinant DNA technology, use DNA molecules from different sources, which are combined into one molecule to create a new set of genes. This DNA is then transferred into an organism, giving **it** modified or novel genes. Transgenic organisms, a subset of GMOs, are organisms which have inserted DNA that originated in a different species. Some GMOs contain no DNA from other species and are therefore not transgenic but cisgenic.

http://en.wikipedia.org/wiki/Genetically_modified_organism

Answer: .....

27 Most of the muscle in an alligator's jaw is intended for biting and gripping prey. The muscles that close the jaws are exceptionally powerful, however the muscles for opening their jaws are relatively weak in comparison. As a result, an adult man can hold an alligator's jaws shut with his bare hands. In general, a strip of duct tape is enough to prevent an adult alligator from opening its jaws and is one of the most common methods used when alligators are to be captured and/or transported. Alligators are generally timid towards humans and tend to walk or swim away if one approaches. Unfortunately, **this** has led some people to the practice of approaching alligators and their nests in a way that may provoke the animals into attacking. In the state of Florida, it is illegal to feed wild alligators at any time. If fed, the alligators will eventually lose their fear of humans and will learn to associate humans with food, thereby becoming a greater danger to people.

http://en.wikipedia.org/wiki/Alligator

Answer: .....

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28 Carbon nanotubes (CNTs) are allotropes of carbon with a cylindrical nanostructure. Nanotubes have been constructed with length-to-diameter ratio of up to 132,000,000:1, which is significantly larger than any other material. **These** have novel properties that make them potentially useful in many applications in nanotechnology, electronics, optics and other fields of materials science, as well as potential uses in architectural fields. They exhibit extraordinary strength and unique electrical properties, and are efficient thermal conductors. Their final usage, however, may be limited by their potential toxicity and controlling their property changes in response to chemical treatment.

http://en.wikipedia.org/wiki/Carbon_nanotube

Answer: .....

29 A wave is a disturbance that propagates through space and time, usually with transference of energy. A mechanical wave is a wave that propagates or travels through a medium due to the restoring forces it produces upon deformation. For example, when a sound wave is traveling through the air, air molecules slam into their neighbors, which pushes their neighbors into their neighbors (and so on); but when air molecules collide with their neighbors, they also bounce away from them back in the direction they came from. **These collisions** provide a restoring force that keeps the molecules from actually traveling with the wave.

http://en.wikipedia.org/wiki/Wave

Answer: .....

30 The scientific consensus expressed in the 2007 Intergovernmental Panel on Climate Change (IPCC) Summary for Policymakers is for the water cycle to continue to intensify throughout the 21st century, though this does not mean that precipitation will increase in all regions. In subtropical land areas — places that are already relatively dry — precipitation is projected to decrease during the 21st century, increasing the probability of drought. The drying is projected to be strongest near the poleward margins of the subtropics (for example, the Mediterranean Basin, South Africa, southern Australia, and the Southwestern United States). Annual precipitation amounts are expected to increase in near-equatorial regions that tend to be wet in the present climate, and also at high latitudes. **These large-scale patterns** are present in nearly all of the climate model simulations conducted at several international research centers as part of the 4th Assessment of the IPCC.

http://en.wikipedia.org/wiki/Water_cycle

Answer: .....

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3.2 Definitions

Which words are defined in scientific texts?

Technical words - words that are rare but which are specific to their subject or domain - are often defined in scientific texts.

Why are technical words defined in scientific texts?

Scientific texts contain many words that are rare and perhaps even so exclusive to a domain of science that they are not even listed in a regular dictionary. Despite their rarity, however, these scientific words need to be defined because they are essential terminology within their context or field.

How do I notice the technical terms?

Writers of scientific articles will usually try to make the important technical words stand out in some way. There are three basic ways that a writer can highlight the text: **bold**, *italic*, or ***bold italic***. Writers will define the key technical terms using defining verbs such as *denotes*, *indicates*, *involves*, or *is defined as*. Writers can also employ punctuation such as parentheses, semi-colons, dashes, commas or quotation marks. Finally, writers will often clarify or explain technical words using restatement signals such as "that is", "ie;" or "or".

1 highlighted text

bold	*italic*	***bold italic***

2 Defining verbs

concerns	denotes	describes
indicates	involves	is
is called	is characterized by	is concerned with
is defined as	is known as	means
refers to	stands for	term

3 Punctuation

( )	:	— —	,	" "	' '
parentheses	colon	dashes	comma	quotation marks	

4 Restatement signals

that is	ie:	or

Examples

1 The term **ecosystem** refers to the combined physical and biological components of an environment.

technical term: ecosystem

definition: the combined physical and biological components of an environment

hint: term, **bold**, refers to

2 The **kinetic energy** of an object is the extra energy which it possesses due to its motion. It is defined as *the work needed to accelerate a body of a given mass from rest to its current velocity*.

technical term: kinetic energy

definition: the extra energy of an object due to its motion / the work needed to accelerate a body of a given mass from rest to its current velocity

hint: **bold**, is..., is defined as, *italic*

3 Alzheimer's disease has been identified as a protein misfolding disease (proteopathy), caused by accumulation of abnormally folded A-beta and tau proteins in the brain.

a **technical term**: Alzheimer's disease

definition: a protein misfolding disease caused by accumulation of abnormally folded A-beta and tau proteins in the brain

hint: has been defined as

b **technical term**: proteopathy

definition: a protein misfolding disease

hint: ()

4 **Angina pectoris**, commonly known as **angina**, is severe chest pain due

to ischemia (a lack of blood and hence oxygen supply) of the heart muscle, generally due to obstruction or spasm of the coronary arteries (the heart's blood vessels).

a **technical term**: angina pectoris / angina

definition: severe chest pain due to ischemia

hint: **bold**, known as, is

b **technical term**: ischemia

definition: a lack of blood and hence oxygen supply

hint: ()

c **technical term**: coronary arteries

definition: the heart's blood vessels

hint: ()

3.2 Definitions

Exercise

Read the texts below. Each text contains technical terms and definitions for you to identify.

1 **Solid-state physics**, the largest branch of condensed matter physics, is the study of rigid matter, or solids, through methods such as quantum mechanics, crystallography, electromagnetism and metallurgy. Solid-state physics considers how the large-scale properties of solid materials result from their atomic-scale properties. Solid-state physics thus forms the theoretical basis of materials science, as well as having direct applications, for example in the technology of transistors and semiconductors.

http://en.wikipedia.org/wiki/Solid-state_physics

technical term: .....

definition: .....

.....

hint: .....

2 **Stigma** — is the receptive tip of the carpel, which receives pollen at pollination and on which the pollen grain germinates. The stigma is adapted to catch and trap pollen, either by combining pollen of visiting insects or by various hairs, flaps, or sculpturings.

http://en.wikipedia.org/wiki/Stigma_(botany)

technical term: .....

definition: .....

.....

hint: .....

3 The result of breathing elevated concentrations of oxygen is *hyperoxia*, an excess of oxygen in body tissues.

http://en.wikipedia.org/wiki/Oxygen_toxicity

technical term: .....

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definition: .....

.....

hint: .....

4 **Statistics** is the science of making effective use of numerical data relating to groups of individuals or experiments. It deals with all aspects of this, including not only the collection, analysis and interpretation of such data, but also the planning of the collection of data, in terms of the design of surveys and experiments.

http://en.wikipedia.org/wiki/Statistics

technical term: .....

definition: .....

.....

hint: .....

5 The term *blood pressure* usually refers to the pressure measured at a person's upper arm. It is measured on the inside of an elbow at the brachial artery, which is the upper arm's major blood vessel that carries blood away from the heart. A person's BP is usually expressed in terms of the systolic pressure and diastolic pressure, for example 120/80.

http://en.wikipedia.org/wiki/Blood_pressure

technical term: .....

definition: .....

.....

hint: .....

6 **Nuclear power** is power (generally electrical) produced from controlled (i.e., non-explosive) nuclear reactions. Commercial plants in use to date use nuclear fission reactions. Electric utility reactors heat water to produce steam, which is then used to generate electricity. In 2009, 15% of the world's electricity came from nuclear power, despite concerns about safety and radioactive waste management. More than 150 naval vessels using nuclear propulsion have been built.

http://en.wikipedia.org/wiki/Nuclear_power

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technical term: .....

definition: .....

.....

hint: .....

7 The **asteroid belt** is the region of the Solar System located roughly between the orbits of the planets Mars and Jupiter. It is occupied by numerous irregularly shaped bodies called asteroids or minor planets. The asteroid belt region is also termed the **main belt** to distinguish it from other concentrations of minor planets within the Solar System, such as the Kuiper belt and scattered disc.

http://en.wikipedia.org/wiki/Asteroid_belt

technical term: .....

definition: .....

.....

hint: .....

8 A **peptide bond** (amide bond) is a chemical bond formed between two molecules when the carboxyl group of one molecule reacts with the amine group of the other molecule, thereby releasing a molecule of water (H2O). This is a dehydration synthesis reaction (also known as a condensation reaction), and usually occurs between amino acids. The resulting CO-NH bond is called a peptide bond, and the resulting molecule is an amide.

http://en.wikipedia.org/wiki/Peptide_bond

technical term: .....

definition: .....

.....

hint: .....

9 The half-life of caffeine **—** the time required for the body to eliminate one-half of the total amount of caffeine **—** varies widely among individuals according to such factors as age, liver function, pregnancy, some concurrent medications, and the level of enzymes in the liver needed for caffeine metabolism. In healthy adults, caffeine's half-life is approximately 4.9 hours. In women taking oral contraceptives, this is increased to 5–10 hours, and in pregnant women the

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half-life is roughly 9–11 hours. Caffeine can accumulate in individuals with severe liver disease, increasing its half-life up to 96 hours. In infants and young children, the half-life may be longer than in adults; half-life in a newborn baby may be as long as 30 hours. Other factors such as smoking can shorten caffeine's half-life. Fluvoxamine reduced the clearance of caffeine by 91.3%, and prolonged its elimination half-life by 11.4-fold (from 4.9 hours to 56 hours).

http://en.wikipedia.org/wiki/Caffeine

technical term: .....

definition: .....

.....

hint: .....

10 A **mule** is the offspring of a male donkey and a female horse. Horses and donkeys are different species, with different numbers of chromosomes. Of the two F1 hybrids between these two species, a mule is easier to obtain than a hinny (the offspring of a male horse and a female donkey). All male mules and most female mules are infertile.

http://en.wikipedia.org/wiki/Mule

technical term: .....

definition: .....

.....

hint: .....

technical term: .....

definition: .....

.....

hint: .....

11 The science of color is sometimes called ***chromatics***. It includes the perception of color by the human eye and brain, the origin of color in materials, color theory in art, and the physics of electromagnetic radiation in the visible range (that is, what we commonly refer to simply as *light*).

http://en.wikipedia.org/wiki/Color

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technical term: .....

definition: .....

.....

hint: .....

technical term: .....

definition: .....

.....

hint: .....

12 The **CMYK color model**, referred to as **process color** or sometimes four color, is a subtractive color model, used in color printing, also used to describe the printing process itself. **CMYK** refers to the four inks used in most color printing: **c**yan, **m**agenta, **y**ellow, and **k**ey black. Though it varies by print house, press operator, press manufacturer and press run, ink is typically applied in the order of the abbreviation.

http://en.wikipedia.org/wiki/CMYK_color_model

technical term: .....

definition: .....

.....

hint: .....

technical term: .....

definition: .....

.....

hint: .....

13 A **lunar phase** or **phase of the moon** refers to the appearance of the illuminated portion of the Moon as seen by an observer, usually on Earth. The lunar phases vary cyclically as the Moon orbits the Earth, according to the changing relative positions of the Earth, Moon and Sun. One half of the lunar surface is always illuminated by the Sun (except during lunar eclipses), and hence is bright, but the portion of the illuminated hemisphere that is visible to

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an observer can vary from 100% (full moon) to 0% (new moon). The boundary between the illuminated and unilluminated hemispheres is called the terminator.

http://en.wikipedia.org/wiki/Lunar_phase

technical term: .....

definition: .....

.....

hint: .....

technical term: .....

definition: .....

.....

hint: .....

14 A **cyanide** is any chemical compound that contains the cyano group (C≡N), which consists of a carbon atom triple-bonded to a nitrogen atom. Inorganic cyanides are generally salts of the anion CN^-. Organic compounds that have a –C≡N functional group are called nitriles. Of the many kinds of cyanide compounds, some are gases; others are solids or liquids. Those that can release the cyanide ion CN^- are highly toxic to animals.

http://en.wikipedia.org/wiki/Cyanide

technical term: .....

definition: .....

.....

hint: .....

technical term: .....

definition: .....

.....

hint: .....

15 The general term "**ice age**" or, more precisely, "**glacial age**" denotes a

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geological period of long-term reduction in the temperature of the Earth's surface and atmosphere, resulting in an expansion of continental ice sheets, polar ice sheets and alpine glaciers. An ice age is a natural system. Within a long-term ice age, individual pulses of extra cold climate are termed "glacial periods" (or alternatively "glacials" or "glaciations"), and intermittent warm periods are called "interglacials". Glaciologically, ice age implies the presence of extensive ice sheets in the northern and southern hemispheres; by this definition we are still in the ice age that began at the start of the Pleistocene (because the Greenland and Antarctic ice sheets still exist).

http://en.wikipedia.org/wiki/Ice_age

technical term: .....

definition: .....

.....

hint: .....

technical term: .....

definition: .....

.....

hint: .....

technical term: .....

definition: .....

.....

hint: .....

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3.3 Prefixes, Roots and Suffixes

Why should I study prefixes, roots and suffixes?

Over half of the words in the English language are derived from Greek or Latin roots. Many scientific terms are also based on these two languages. A good knowledge of Greek and Latin prefixes, roots and suffixes will help you understand words without having to rely too much on a dictionary. Consequently, if you learn these prefixes, roots and suffixes, not only will your vocabulary improve but also your reading fluency. It is therefore important to spend some time studying prefixes, roots, and suffixes.

Which prefixes, roots and suffixes should I learn?

Appendices 5 and 6 contain many useful prefixes, roots and suffixes.

How should I study prefixes, roots and suffixes?

You should, first of all, be aware of the major prefixes, roots and suffixes. Appendices 5 and 6 have most of the ones you will need to know. You should also learn to recognize these prefixes, roots, and suffixes while you are reading. These prefixes, roots and suffixes are combined with other words or partial words to make new words. If you can guess the meaning of these words and partial words, then you may be able to understand new words without relying too much on your dictionary. Furthermore, even if you think that this method of learning is too slow initially, in the long run you will probably benefit, as your understanding and appreciation of words and their semantic relationships with other words will be deeper and richer.

Example: What do the highlighted words in the text below mean?

Fermentation is the process of deriving energy from the **oxidation** of organic **compounds**, such as **carbohydrates**, and using an endogenous electron acceptor, which is usually an organic compound, as opposed to respiration where electrons are donated to an exogenous electron acceptor, such as oxygen, via an electron transport chain. Fermentation does not necessarily have to be carried out in an **anaerobic** environment. For example, even in the presence of abundant oxygen, yeast cells greatly prefer fermentation to oxidative phosphorylation, as long as sugars are readily available for **consumption**.

http://en.wikipedia.org/wiki/Fermentation_(biochemistry)

Word	**Prefixes, Roots, Suffixes**	**Meaning**
oxidation	oxygen, -ation	action of oxygen
compounds	com, ?	with ?
carbohydrates	carbon, hydro	CH_20

anaerobic	an, aerobic	not aerobic
consumption	consume, -ion	noun for consume

As you can see, many words can be guessed at without having to use a dictionary. Of course you may still use your dictionary just to check, and this is okay so long as you don't overdo it. From the above table, you will probably need to look up the meaning of "compound" (if you don't already know its meaning). Actually, "compound" is one of the words in the 570 word families of the Academic Word List. You can find the meaning of this word in the Academic Word List concise dictionary in Appendix 8.1 (a substance made up of two or more elements).

You should also bear in mind that many words are difficult to break down into smaller parts because some word prefixes and suffixes either have no clear meaning or perhaps have more than one possible meaning.

For example, "flammable" means a liquid which can be burned (able to make a flame). You might therefore think that "inflammable" would mean "not able to make a flame, since "in" means "not" in some words. As a matter of fact, "inflammable" means burnable, too. Therefore, please be flexible (don't be inflexible), when doing the following exercises.

3.3 Prefixes, Roots and Suffixes

Exercise

Read the texts below. Use appendices 5 and 6. What do the highlighted words mean?

1 Electromagnetic radiation (often abbreviated E-M radiation or EMR) is a phenomenon that takes the form of self-propagating waves in a vacuum or in matter. It consists of electric and magnetic field **components** which oscillate in phase perpendicular to each other and perpendicular to the direction of energy propagation. Electromagnetic radiation is classified into several types according to the frequency of its wave; these types include (in order of increasing frequency and decreasing wavelength): radio waves, microwaves, **terahertz** radiation, **infrared** radiation, visible light, **ultraviolet** radiation, X-rays and gamma rays. A small and somewhat variable window of frequencies is sensed by the eyes of various organisms; this is what is called the visible spectrum, or light.

http://en.wikipedia.org/wiki/Electromagnetic_radiation

Word	**Prefixes, Roots, Suffixes**	**Meaning**
components		
terahertz		
infrared		
ultraviolet		

2 The blood vessels are the part of the **circulatory** system that **transport** blood throughout the body. There are three major types of blood vessels: the arteries, which carry the blood away from the heart; the capillaries, which **enable** the actual **exchange** of water and chemicals between the blood and the tissues; and the veins, which carry blood from the capillaries back towards the heart.

http://en.wikipedia.org/wiki/Blood_vessel

Word	**Prefixes, Roots, Suffixes**	**Meaning**
circulatory		
transport		
enable		
exchange		

3 Waste management is the collection, transport, processing, **recycling** or **disposal**, and monitoring of waste materials. The term usually relates to materials produced by human activity, and is generally undertaken to **reduce** their effect on health, the environment or aesthetics. Waste management is also carried out to recover **resources** from it. Waste management can involve solid,

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liquid, gaseous or radioactive substances, with different methods and fields of expertise for each.

http://en.wikipedia.org/wiki/Waste_management

Word	Prefixes, Roots, Suffixes	Meaning
recycling		
disposal		
reduce		
resources		

4 Animals are a major group of mostly **multicellular**, eukaryotic organisms of the kingdom Animalia or Metazoa. Their body plan eventually becomes fixed as they develop, although some undergo a process of **metamorphosis** later on in their life. Most animals are **motile**, meaning they can move **spontaneously** and independently. All animals are also heterotrophs, meaning they must ingest other organisms for sustenance.

http://en.wikipedia.org/wiki/Animal

Word	Prefixes, Roots, Suffixes	Meaning
multicellular		
metamorphosis		
motile		
spontaneously		

5 Since the water molecule is not **linear** and the oxygen atom has a higher **electronegativity** than hydrogen atoms, it carries a slight negative charge, whereas the hydrogen atoms are slightly positive. As a result, water is a polar molecule with an electrical **dipole** moment. The net interactions between the dipoles on each molecule cause an effective skin effect at the interface of water with other substances, or air at the surface, the latter given rise to water's high surface tension. This dipolar nature contributes to water molecules' tendency to form hydrogen bonds which cause water's many special properties. The **polar** nature also favors adhesion to other materials.

http://en.wikipedia.org/wiki/Properties_of_water

Word	Prefixes, Roots, Suffixes	Meaning
linear		
electronegativity		
dipole		
polar		

6 **Bioinformatics** is the application of information technology and computer science to the field of molecular biology. The term bioinformatics was coined

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by Paulien Hogeweg in 1979 for the study of informatic processes in **biotic** systems. Its primary use since at least the late 1980s has been in **genomics** and **genetics**, particularly in those areas of genomics involving large-scale DNA sequencing. Bioinformatics now entails the creation and advancement of databases, algorithms, computational and statistical techniques, and theory to solve formal and practical problems arising from the management and analysis of biological data.

http://en.wikipedia.org/wiki/Bioinformatics

Word	**Prefixes, Roots, Suffixes**	**Meaning**
bioinformatics		
biotic		
genomics		
genetics		

7 **Autism** is a **disorder** of neural development characterized by impaired social **interaction** and communication, and by restricted and repetitive behavior. These signs all begin before a child is three years old. Autism affects information processing in the brain by altering how nerve cells and their synapses connect and organize; how this occurs is not well understood. The two other autism spectrum disorders (ASD) are Asperger syndrome, which lacks delays in **cognitive** development and language, and PDD-NOS, diagnosed when full criteria for the other two disorders are not met.

http://en.wikipedia.org/wiki/Autism

Word	**Prefixes, Roots, Suffixes**	**Meaning**
autism		
disorder		
interaction		
cognitive		

8 Insects (from Latin: insectum, translation of Greek: entomon - threaded) are a class within the **arthropods** that have a chitinous **exoskeleton**, a three-part body (head, thorax, and abdomen), three pairs of jointed legs, compound eyes, and two **antennae**. They are among the most diverse group of animals on the planet and include more than a million described species and represent more than half of all known living organisms. The number of extant species is estimated at between six and ten million, and potentially represent over 90% of the differing metazoan life forms on Earth. Insects may be found in nearly all environments, although only a small number of species occur in the oceans, a habitat dominated by another arthropod group, the **crustaceans**.

http://en.wikipedia.org/wiki/Insect

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Word	Prefixes, Roots, Suffixes	Meaning
arthropod		
exoskeleton		
antennae		
crustacean		

9 Modern **synthetic** chemistry has reached the point where it is possible to prepare small molecules to almost any structure. These methods are used today to **manufacture** a wide variety of useful chemicals such as pharmaceuticals or commercial **polymers**. This ability raises the question of extending this kind of control to the next-larger level, seeking methods to assemble these single molecules into **supramolecular** assemblies consisting of many molecules arranged in a well defined manner.

http://en.wikipedia.org/wiki/Nanotechnology

Word	Prefixes, Roots, Suffixes	Meaning
synthetic		
manufacture		
polymer		
supramolecular		

10 Cancers are caused by **abnormalities** in the genetic material of the **transformed** cells. These abnormalities may be due to the effects of carcinogens, such as tobacco smoke, radiation, chemicals, or infectious agents. Other cancer-promoting genetic abnormalities may randomly occur through errors in DNA replication, or are inherited, and thus present in all cells from birth. The heritability of cancers is usually affected by **complex interactions** between carcinogens and the host's genome.

http://en.wikipedia.org/wiki/Cancer

Word	Prefixes, Roots, Suffixes	Meaning
abnormailities		
transformed		
complex		
interactions		

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3.4 Context

What is context?

Context, in its most broadest sense begins with the reader and his or her background and experiences, expectations and purpose for reading. Within any particular text, context can refer to the whole text, a group of paragraphs, a paragraph, sentence, or single word.

How can context help the reader understand a text?

An ability to identify the topic and main idea of a text, whether it is a paragraph or longer, is an important skill in reading (see unit 2.1 about identifying topics, topic sentences and main ideas) The distribution of logical connectors can help a reader to understand the development of ideas (see unit 2.2 on logical connectors and the development of ideas). The type and frequency of logical connectors may suggest the kind of text organization there is (see unit 2.3 for information about text organization). A knowledge of pronouns and determiners is helpful in understanding coherence (see unit 3.1 on restatements). The methods writers employ to define words is also clearly very useful (see 3.2 about definitions). Finally, a good understanding of prefixes and suffixes will help the reader to guess the meaning of a new word (see 3.3 on prefixes, roots and suffixes). All of these skills can help the reader understand a text.

How can I use context to understand the meaning of a new word?

First of all you should decide what part of speech the word is. Is it a verb, a noun, a pronoun, an adjective, an adverb, a preposition, or a conjunction or an interjection? Secondly, you should look at the context of the word. What words surround the word you want to know? Are there any hints, such as definitions, restatements, or logical connectors which may suggest what the word means? Thirdly, you should analyze the parts of the word for hints about the meaning. Next, you should guess the meaning of the word. Can you substitute your word for the new word within the sentence and the sentence still retain its meaning? Finally, if you need to, you should use your dictionary to see if your guess was a good one. You may wonder why you can't just use your dictionary straight away, and this is a fair point. However, if you want to develop good reading skills, please consider taking the longer route first. In the end, your understanding will be richer and it may actually save time.

Examples

Read the texts below. What are the meanings of the highlighted words?

1 A solar eclipse occurs when the Moon passes between the Sun and the Earth, and the Moon fully or partially covers the Sun as viewed from some location on Earth. This can only happen during a new moon, when the Sun and Moon are in conjunction as seen from Earth. At least two, and up to five, solar eclipses occur each year; no more than two can be total eclipses. Total solar eclipses are nevertheless rare at any particular location because totality exists only along a narrow path traced by the Moon's **umbra**.

part of speech: noun

word parts: nothing

my definition: a narrow path made by the moon can only mean shadow

dictionary definition: a region of complete shadow

2 Radioactive decay is the process in which an unstable atomic nucleus spontaneously loses energy by emitting ionizing particles and radiation. This decay, or loss of energy, results in an atom of one type, called the parent nuclide transforming to an atom of a different type, named the daughter nuclide. For example: a carbon-14 atom (the "parent") emits radiation and transforms to a nitrogen-14 atom (the "daughter"). This is a **stochastic** process on the atomic level, in that it is impossible to predict when a given atom will decay, but given a large number of similar atoms the decay rate, on average, is predictable.

part of speech: adjective

word parts: "-ic" suggests an adjective

my definition: impossible to predict at an atomic level, but predictable in large numbers

dictionary definition: describes a process or system that is connected with random probability

3 Animals are a major group of mostly multicellular, **eukaryotic** organisms of the kingdom Animalia or Metazoa. Their body plan eventually becomes fixed as they develop, although some undergo a process of metamorphosis later on in their life. Most animals are motile, meaning they can move spontaneously and independently. All animals are also heterotrophs, meaning they must ingest other organisms for sustenance.

part of speech: adjective

word parts: "eu" means good, well, true, "-ic" means adjective

my definition: mostly multicellular?

dictionary definition: having cells with `good' or membrane-bound nuclei

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3.4 Context

Exercise

Read the texts below. What are the meanings of the highlighted words?

1 The term cloud is used as a metaphor for the Internet, based on the cloud drawing used in the past to represent the telephone network, and later to depict the Internet in computer network diagrams as an abstraction of the underlying **infrastructure** it represents. Typical cloud computing providers deliver common business applications online which are accessed from a web browser, while the software and data are stored on servers.

http://en.wikipedia.org/wiki/Cloud_computing

part of speech: .....

word parts: .....

my definition: .....

dictionary definition: .....

2 **Hypertension** can be classified as either essential (primary) or secondary. Essential or primary hypertension means that no medical cause can be found to explain the raised blood pressure. It is common. About 90-95% of hypertension is essential hypertension. Secondary hypertension indicates that the high blood pressure is a result of (i.e., secondary to) another condition, such as kidney disease or tumours (adrenal adenoma or pheochromocytoma).

http://en.wikipedia.org/wiki/Hypertension

part of speech: .....

word parts: .....

my definition: .....

dictionary definition: .....

3 **Hypoglycemia** can produce a variety of symptoms and effects but the principal problems arise from an inadequate supply of glucose as fuel to the brain, resulting in impairment of function (neuroglycopenia). Effects can range from

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vaguely "feeling bad" to seizures, unconsciousness, and (rarely) permanent brain damage or death.

http://en.wikipedia.org/wiki/Hypoglycemia

part of speech: .....

word parts: .....

my definition: .....

dictionary definition: .....

4 The habitat of the beaver is the riparian zone, inclusive of stream bed. The actions of beavers for hundreds of thousands of years in the Northern Hemisphere have kept these watery systems healthy and in good repair, although a human observing all the downed trees might think that the beavers were doing just the opposite. The beaver works as a **keystone** species in an ecosystem by creating wetlands that are used by many other species. Next to humans, no other extant animal appears to do more to shape its landscape.

http://en.wikipedia.org/wiki/Beaver

part of speech: .....

word parts: .....

my definition: .....

dictionary definition: .....

5 Coral reefs cover just under one percent of the surface of the world's ocean, yet they support over one-quarter of all marine species. This huge number of species results in complex food webs, with large predator fish eating smaller forage fish that eat yet smaller zooplankton and so on. However, all food webs eventually depend on plants, which are the primary producers. And the primary productivity on a coral reef is very high, resulting in a typical **biomass** production of 5-10g C m^{-2} day^{-1}.

http://en.wikipedia.org/wiki/Coral_reef

part of speech: .....

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word parts: .....

my definition: .....

dictionary definition: .....

Note: 5-10g C m−2 day−1 is read "five to ten grams of carbon per square meter per day".

6 The emission spectrum can be used to determine the composition of a material, since it is different for each element of the periodic table. One example is astronomical spectroscopy: identifying the composition of stars by analysing the received light. The emission spectrum characteristics of some elements are plainly visible to the naked eye when these elements are heated. For example, when platinum wire is dipped into a strontium nitrate solution and then inserted into a flame, the strontium atoms emit a red color. Similarly, when copper is inserted into a flame, the flame becomes green. These definite characteristics allow elements to be identified by their atomic emission spectrum. Not all lights emitted by the spectrum are viewable to the naked eye, it also includes ultra violet rays and infra red lighting, an emission is formed when an excited gas is viewed directly though a **spectroscope**.

http://en.wikipedia.org/wiki/Emission_spectrum

part of speech: .....

word parts: .....

my definition: .....

dictionary definition: .....

7 In chemistry and physics, atomic theory is a theory of the nature of matter, which states that matter is composed of **discrete** units called atoms, as opposed to the obsolete notion that matter could be divided into any arbitrarily small quantity. It began as a philosophical concept in ancient Greece and India and entered the scientific mainstream in the early 19th century when discoveries in the field of chemistry showed that matter did indeed behave as if it were made up of particles.

http://en.wikipedia.org/wiki/Atomic_theory

part of speech: .....

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word parts: .....

my definition: .....

dictionary definition: .....

8 Gravitation, or gravity, is one of the four fundamental interactions of nature, and is the means by which objects with mass attract one another. In everyday life, gravitation is most familiar as the agent that lends weight to objects with mass and causes them to fall to the ground when dropped. Gravitation causes dispersed matter to **coalesce**, thus accounting for the existence of the Earth, the Sun, and most of the macroscopic objects in the universe. It is responsible for keeping the Earth and the other planets in their orbits around the Sun; for keeping the Moon in its orbit around the Earth; for the formation of tides; for convection, by which fluid flow occurs under the influence of a density gradient and gravity; for heating the interiors of forming stars and planets to very high temperatures; and for various other phenomena observed on Earth.

http://en.wikipedia.org/wiki/Gravitation

part of speech: .....

word parts: .....

my definition: .....

dictionary definition: .....

9 The class Gastropoda or gastropods (also previously known as univalves and sometimes also spelled Gasteropoda) form a major part of the phylum Mollusca. **Gastropods** are more commonly known as snails and slugs, and include those that live in the sea, in freshwater and on land. This class of animals is second only to the insects in its number of known species. Its fossil history goes back to the Late Cambrian.

http://en.wikipedia.org/wiki/Gastropoda

part of speech: .....

word parts: .....

my definition: .....

dictionary definition: .....

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10 Temperature control (thermoregulation) is part of a **homeostatic** mechanism that keeps the organism at optimum operating temperature, as it affects the rate of chemical reactions. In humans the average oral temperature is 36.8 °C (98.2 °F), though it varies among individuals, as well as cycling regularly through the day, as controlled by one's circadian rhythms with the lowest temperature occurring about two hours before one normally wakes up.

http://en.wikipedia.org/wiki/Normal_human_body_temperature

part of speech: .....

word parts: .....

my definition: .....

dictionary definition: .....

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4 Portfolio Management

What is the purpose of making a portfolio?

There are two main reasons why you should manage a portfolio. The first is to carry on practicing the kind or reading skills that you have already started in this textbook. The more you practice, the better you will be. The second reason is to make the selection of reading materials your own. Now is the time to choose texts that you are really interested in!

What should my portfolio contain?

You should choose articles that are related either to your major or your personal interests.

How should I manage my portfolio?

Your portfolio should contain 10 articles*. You should number each article, and for each article, you should highlight all the academic words (those which appear in the Academic Word List 570). Then, you should identify the technical words and write a definition of these words, or translate them into your first language. You should also indicate the text structure of the article. Finally, in your own words, you should write a one paragraph accurate summary of about six or seven sentences, and you should include a personal comment.

*The length of your articles should be at least 700 words.

Please remember to do the following;

a) Choose relevant and interesting articles of appropriate length.

b) Choose articles which are new and not recycled.

c) Highlight the AWL 570 words.

d) Identify the technical words.

e) Indicate the text structure.

f) Make notes to demonstrate your active interest in the text.

g) Write an accurate summary.

h) Include a personal comment.

i) Take pride in the organization and appearance of your portfolio.

5 Academic Words Gap-Fill Exercises

5.1 Academic Words Gap-Fill Exercises

This unit contains paragraphs that have already appeared in previous units of the textbook.

5.2 Academic Words Gap-Fill Exercises

This unit contains paragraphs that are not to be found in any other unit of the textbook.

5 Academic Words Gap-Fill Exercises

Which words do I need to know?

There are two main groups of words in English; those you know, and those you don't know. The words you know are very important to you, as they will help you to understand texts, and also help you to understand the words that you don't know.

The words that you don't know can be divided into three groups; the words that you never need to know, the words that you can get to know if you wish, and the words that you have to know.

The words that you never need to know contain by far the greatest number of words. The only reason why you may need to know these words is when they occasionally appear on English tests. Apart from that, you never need to know them.

The words that you can get to know if you wish, depends on you. These words include words of your major and your interests. How hard you work will determine how many of these words you will eventually get to know.

The final group of words are the words that you have to know. These words are so common in academic texts that you simply can't avoid them. If you get to know these words, your reading will improve dramatically. These words, the 570 words and their families, are the academic word list.

Welcome to the Academic Word List.

The paragraph below appears in unit 2.2 of this textbook. It is about the scientific method. The words in bold are all from the Academic Word List.

Although **procedures vary** from one field of inquiry to another, **identifiable features** distinguish scientific inquiry from other **methodologies** of knowledge. Scientific **researchers** propose **hypotheses** as explanations of **phenomena**, and **design** experimental studies to test these **hypotheses**. These steps must be repeatable in order to dependably **predict** any future results. **Theories** that encompass wider **domains** of inquiry may bind many independently-derived **hypotheses** together in a **coherent**, supportive **structure**. This in turn may help form new **hypotheses** or place groups of **hypotheses** into **context**.

As you can see, the Academic Word List words are everywhere. You must learn these words, so please make time to do so.

5.1 Academic Words Gap-Fill Exercises

This unit contains paragraphs that have already appeared in previous units of the textbook. This time, the academic words have all been blanked out.

Exercise

Read the texts below. Fill in the blanks from the Academic Word List words below.

1 Geometry (Ancient Greek: geo- "earth", -metria "measurement") "Earth-Measuring" is a part of mathematics concerned with questions of size, shape, relative position of figures, and the properties of space. Geometry is one of the oldest sciences. ..... a body of practical knowledge concerning lengths, ..., and ....., in the 3rd century BC, geometry was put into an axiomatic form by Euclid, whose treatment—Euclidean geometry—set a standard for many centuries to follow. The field of astronomy, especially mapping the positions of the stars and planets on the celestial ....., served as an important ..... of geometric problems during the next one and a half millennia. A mathematician who works in the field of geometry is called a geometer.

http://en.wikipedia.org/wiki/Geometry

areas	initially	source	sphere	volumes

2 Some of the greatest mathematical minds of all ages, from Pythagoras and Euclid in ancient Greece, through the medieval Italian mathematician Leonardo of Pisa and the Renaissance astronomer Johannes Kepler, to present-day scientific figures such as Oxford physicist Roger Penrose, have spent endless hours over this simple ..... and its properties. But the fascination with the golden ..... is not .....

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just to mathematicians. Biologists, artists, musicians, historians, architects, ..., and even mystics have pondered and ..... the basis of its ubiquity and appeal. In fact, it is probably fair to say that the golden ..... has inspired thinkers of all disciplines like no other number in the history of mathematics.

http://en.wikipedia.org/wiki/Golden_ratio

confined	debated	psychologists	ratio	ratio
ratio				

3 In physics, ... is the magnitude of the pulling force exerted by a string, cable, chain, or ..... object on another object. It is the opposite of compression. As ..... is the magnitude of a force, it is measured in newtons (or sometimes pounds-force) and is always measured ..... to the string on which it applies. There are two basic possibilities for systems of objects held by strings. Either acceleration is zero and the system is therefore in equilibrium or there is acceleration and therefore a net force is present. Note that a string is ..... to have negligible mass.

http://en.wikipedia.org/wiki/Tension_(physics)

assumed	parallel	similar	tension	tension

4 Elementary particles are particles for which there is no known way of dividing them into smaller units. ..... and experimental studies have shown that the spin possessed by such particles cannot be explained by postulating that they are made up of even smaller particles rotating about a common center of mass (see ..... electron radius); as far as can be determined, these elementary particles are true point particles. The spin

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of an elementary particle is a truly .... property, akin to the particle's electric charge and rest mass.

http://en.wikipedia.org/wiki/Spin_(physics)

classical	intrinsic	physical	theoretical	

5 Genetics (from Ancient Greek: genesis, "origin"), a discipline of biology, is the science of heredity and ..... in living organisms. The fact that living things inherit traits from their parents has been used since prehistoric times to improve crop plants and animals through ..... breeding. However, the modern science of genetics, which ..... to understand the ..... of inheritance, only began with the work of Gregor Mendel in the mid-nineteenth century. Although he did not know the ..... basis for heredity, Mendel observed that organisms inherit traits .... units of inheritance, which are now called genes.

http://en.wikipedia.org/wiki/Genetics

discrete	physical	process	seeks	selective
variation	via			

6 The Doppler effect (or Doppler .....), named after Austrian physicist Christian Doppler who proposed it in 1842, is the change in frequency of a wave for an observer moving relative to the ..... of the wave. It is commonly heard when a ..... sounding a siren or horn ....., passes, and recedes from an observer. The received frequency is higher (compared to the emitted frequency) during the ..... it is ..... at the instant of passing by, and it is lower during the recession.

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http://en.wikipedia.org/wiki/Doppler_effect

approach	approaches	identical	shift	source
vehicle				

7 The presence of ocean blooms is usually seasonal, ... to prey ..... and increasing with temperature and sunshine. Ocean currents tend to congregate jellyfish into large swarms or "blooms", ... of hundreds or thousands of ..... In addition to sometimes being ..... by ocean currents, blooms can result from unusually high populations in some years. Bloom formation is a .... that depends on ocean currents, nutrients, temperature and oxygen concentrations. Jellyfish are better able to ..... in oxygen-poor water than competitors, and thus can thrive on plankton without competition. Jellyfish may also ..... from saltier waters, as saltier waters contain more iodine, which is necessary for polyps to turn into jellyfish. Rising sea temperatures caused by climate change may also ..... to jellyfish blooms, because many species of jellyfish are better able to ..... in warmer waters. Jellyfish are likely to stay in blooms that are quite large and can reach up to 100,000 in each.

http://en.wikipedia.org/wiki/Jellyfish

availability	benefit	complex	concentrated	consisting
contribute	individuals	process	responding	survive
survive				

8 The International Union for Conservation of Nature now lists ..... warming as the most ..... threat to the polar bear, ... because the melting of its sea ice habitat reduces its

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ability to find ..... food. The IUCN states, "If climatic ..... continue, polar bears may become extirpated from most of their ..... within 100 years." On 14 May 2008, the United States Department of the Interior listed the polar bear as a threatened species under the Endangered Species Act.

http://en.wikipedia.org/wiki/Polar_bear

global	primarily	range	significant	sufficient
trends				

9 From its discovery in 1930 until 2006, Pluto was considered the Solar System's ninth planet. In the late 1970s, following the discovery of ..... planet 2060 Chiron in the outer Solar System and the recognition of Pluto's very low mass, its ..... as a ..... planet began to be questioned. Later, in the early 21st century, many objects ..... to Pluto were discovered in the outer Solar System, notably the scattered disc object Eris, which is 27% more massive than Pluto. On August 24, 2006, the International Astronomical Union (IAU) ..... the term "planet" for the first time. This .... Pluto as a planet, and added it as a member of the new ..... "dwarf planet" along with Eris and Ceres. After the reclassification, Pluto was added to the list of ..... planets and given the number 134340. Even so, a number of scientists continue to hold that Pluto should be classified as a planet.

http://en.wikipedia.org/wiki/Pluto

category	defined	definition	excluded	major
minor	minor	similar	status	

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10 Generally, dolphins sleep with only one brain hemisphere in slow-wave sleep at a time, thus ..... enough consciousness to breathe and to watch for possible predators and other threats. Earlier sleep stages can ..... simultaneously in both hemispheres. In captivity, dolphins seemingly enter a fully asleep state where both eyes are closed and there is no ..... to mild ..... stimuli. Respiration is .. ..; a tail kick reflex keeps the blowhole above the water if necessary. Anesthetized dolphins ..... show a tail kick reflex. Though a ..... state has been observed with wild sperm whales, it is not known if dolphins in the wild reach this state. The Indus river dolphin has a different sleep ..... from other dolphin species. Living in water with strong currents and ..... dangerous floating debris, it must swim continuously to avoid ..... As a result, this species sleeps in very short bursts which last between 4 and 60 seconds.

http://en.wikipedia.org/wiki/Dolphin

automatic	external	initially	injury	maintaining
method	occur	potentially	response	similar

11 Zinc-64 is an isotope of zinc. It makes up 48.3% of the zinc naturally ....., ... the fact that it is radioactive. Zinc-64 has an exceptionally long half-life of over 2300 million billion years, much longer than the age of the Universe, and is, over all reasonable time ....., ...

http://www.ask.com/wiki/Zinc-64

despite	occuring	periods	stable	

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12 Karachi ..... an arid climate, ... a more moderate ..... of an arid climate. Karachi is ..... on the coast and as a result has a relatively mild climate. The level of precipitation is low for most of the year. However, due to the city's proximity to the sea, humidity levels usually remain high throughout the year. The city enjoys mild winters and warm summers. Karachi also receives the tail end of the monsoon rains. Since summer temperatures (the end of April through the end of August) are ..... 30 to 35 degrees Celsius, the winter months (November through March) are the best time to visit Karachi.

http://en.wikipedia.org/wiki/Climate_of_Karachi

albeit	approximately	features	located	version

13 Mars is the fourth planet from the Sun in the Solar System. The planet is named after Mars, the Roman god of war. It is also referred to as the "Red Planet" because of its reddish appearance, due to iron oxide prevalent on its surface. Mars is a terrestrial planet with a thin atmosphere, having surface ..... reminiscent both of the ..... craters of the Moon and the volcanoes, valleys, deserts and polar ice caps of Earth. Unlike the Earth, Mars is now a geologically inactive planet with no known tectonic activity. It is the ..... of Olympus Mons, the highest known mountain in the Solar System, and of Valles Marineris, the largest canyon. In addition to its geographical ..... Mars' rotational ..... and seasonal ..... are .... to those of the Earth.

http://en.wikipedia.org/wiki/Mars

cycles	features	features	impact	likewise

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period	similar	site		

14 ..... to the 20th century, and also into its early ....., the pace of discovery of new species of bird was fast; during this ....., with numerous collecting expeditions into species-rich ..... not ..... visited by western ornithologists, up to several hundred new species per ..... were being described. Since then, the pace has slowed, and new species are generally only being found in remote ....., or among cryptic or secretive groups of species. ....., several tens of species were described for the first time during the 1990s.

http://en.wikipedia.org/wiki/Bird_species_new_to_science

areas	areas	decades	decades	nonetheless
period	previously	prior		

15 Aspirin causes several different effects in the body, mainly the reduction of inflammation, analgesia (relief of pain), and the prevention of clotting, and the reduction of fever. Much of this is believed to be due to decreased production of prostaglandins and thromboxanes. Aspirin's ability to suppress the production of prostaglandins and thromboxanes is due to its ..... inactivation of the cyclooxygenase (COX) enzyme. Cyclooxygenase is ..... for prostaglandin and thromboxane synthesis. Aspirin acts as an acetylating agent where an acetyl group is covalently ..... to a serine residue in the active ..... of the COX enzyme. This makes aspirin different from other NSAIDs (such as diclofenac and ibuprofen), which are ..... inhibitors. However, other effects of aspirin, such as uncoupling oxidative phosphorylation in mitochondria, and the modulation of signaling through NF-κB, are also being .....

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http://en.wikipedia.org/wiki/Aspirin

attached	investigated	irreversible	required	reversible
site				

16 The greenhouse effect is caused by an atmosphere containing gases that absorb and emit infrared radiation. Greenhouse gases trap heat within the surface-troposphere system, causing heating at the surface of the planet or moon.This ..... is ..... different from that of an actual greenhouse, which works by ..... warm air inside the ..... so that heat is not lost by convection. The greenhouse effect was discovered by Joseph Fourier in 1824, first ..... experimented on by John Tyndall in 1858, and first reported quantitatively by Svante Arrhenius in 1896.

http://en.wikipedia.org/wiki/Greenhouse_effect

fundamentally	isolating	mechanism	reliably	structure

17 The two most important types of spacetime singularities are curvature singularities and conical singularities. Singularities can also be divided according to whether they are covered by an event horizon or not (naked singularities). According to general relativity, the ..... state of the universe, at the beginning of the Big Bang, was a singularity. Another type of singularity ..... by general relativity is inside a black hole: any star ..... beyond a certain point would form a black hole, inside which a singularity (covered by an event horizon) would be formed, as all the matter would flow into a certain point (or a circular line, if the black hole is rotating). These singularities are also known as curvature singularities.

http://en.wikipedia.org/wiki/Gravitational_singularity

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collapsing	initial	predicted		

18 A binary star is a star system ..... of two stars orbiting around their common center of mass. The brighter star is called the ..... and the other is its companion star, or secondary. ..... between the early 1800s and today suggests that many stars are part of either binary star systems or star systems with more than two stars, called multiple star systems. The term double star may be used synonymously with binary star, but more generally, a double star may be either a binary star or an optical double star which ..... of two stars with no ..... connection but which appear close together in the sky as seen from the Earth. A double star may be determined to be optical if its ..... have ..... different proper motions or radial velocities, or if parallax measurements ..... its two ..... to be at ..... different distances from the Earth. Most known double stars have not yet been determined to be either bound binary star systems or optical doubles.

http://en.wikipedia.org/wiki/Binary_star

components	components	consisting	consists	physical
primary	research	reveal	sufficiently	sufficiently

19 In somatic cell ...., the nucleus, which contains the organism's DNA, of a somatic cell (a body cell other than a sperm or egg cell) is ..... and the rest of the cell discarded. At the same time, the nucleus of an egg cell is ..... The nucleus of the somatic cell is then ..... into the enucleated egg cell. After being ..... into the egg, the somatic cell nucleus is reprogrammed by the host cell. The egg, now containing the nucleus of a

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somatic cell, is stimulated with a shock and will begin to divide. After many mitotic divisions in ....., this single cell forms a blastocyst (an early stage embryo with about 100 cells) with almost ..... DNA to the original organism.

http://en.wikipedia.org/wiki/Somatic_cell_nuclear_transfer

culture	identical	inserted	inserted	nuclear
removed	removed	transfer		

20 Wolves differ from ..... dogs in a more ..... nature. Anatomically, wolves have smaller orbital angles than dogs (over 53 degrees for dogs, under 45 degrees for wolves) and a comparatively larger brain ..... Larger paw size, yellow eyes, longer legs, and bigger teeth further distinguish ..... wolves from other canids, especially dogs. Also, a supracaudal gland is present at the base of the tail in wolves but not in many dogs.

http://en.wikipedia.org/wiki/Gray_wolf

adult	capacity	domestic	varied	

21 Chloroplasts are organelles found in plant cells and other eukaryotic organisms that ..... photosynthesis. Chloroplasts capture light ..... to conserve free ..... in the form of ATP and reduce NADP to NADPH through a ..... set of ..... called photosynthesis. The word chloroplast is ..... from the Greek words chloros, which means green, and plast, which means form or ..... Chloroplasts are members of a class of organelles known as plastids.

http://en.wikipedia.org/wiki/Chloroplast

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complex	conduct	derived	energy	energy
entity	processes			

22 Two kinds of solar time, ... solar time and mean solar time, are among the three kinds of time that were recognized and measured by astronomers up to the 1950s (the third ..... kind of time being sidereal time, time according to the ..... rotation of the stars). The measures of all these three kinds of time depend on the rotation of the earth. Nowadays both kinds of solar time, along with sidereal time, stand in ..... to newer kinds of time measurement, introduced from the 1950s onwards (starting with ephemeris time), which were ..... to be independent of earth rotation.

http://en.wikipedia.org/wiki/Solar_time

apparent	apparent	contrast	designed	traditional

23 The most common ..... of a volcano is of a conical mountain, spewing lava and poisonous gases from a crater at its summit. This describes just one of many types of volcano, and the ..... of volcanoes are much more complicated. The ..... and behavior of volcanoes depends on a number of ..... Some volcanoes have rugged peaks formed by lava domes rather than a summit crater, ... others present landscape ..... such as massive plateaus. Vents that ..... volcanic material (lava, which is what magma is called once it has escaped to the surface, and ash) and gases (mainly steam and magmatic gases) can be ..... anywhere on the landform. Many of these vents give rise to smaller cones such as Puu Oo on a flank of Hawaii's Kīlauea.

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http://en.wikipedia.org/wiki/Volcano

factors	features	features	issue	located
perception	structure	whereas		

24 Many species of animals use paralyzing toxins in order to capture prey, evade predation, or both. One famous example is the tetrodotoxin of fish species such as Takifugu rubripes, the famously lethal pufferfish of Japanese fugu. This toxin works by binding to sodium ..... in nerve cells, preventing the cells' proper ..... A non-lethal dose of this toxin results in ..... paralysis. This toxin is also present in many other species ..... from toads to nemerteans. Another interesting use of paralysis in the natural world is the behavior of some species of wasp. In order to complete the reproductive ....., the female wasp first paralyzes a prey ..... such as a grasshopper and then places it into her nest. Eggs are then laid on the paralyzed insect, which is devoured by the larvae after they hatch. Many snakes also ..... powerful neurotoxins that can cause non-permanent paralysis or death.

http://en.wikipedia.org/wiki/Paralysis

channels	cycle	exhibit	function	item
ranging	temporary			

25 Historically, galaxies have been ..... according to their ..... shape (usually referred to as their ..... morphology). A common form is the elliptical galaxy, which has an ellipse-shaped light profile. Spiral galaxies are disk-shaped assemblages with dusty, curving arms. Galaxies with irregular or unusual shapes are known as peculiar galaxies, and typically result from disruption by the gravitational pull of neighboring galaxies. Such ..... between nearby galaxies,

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which may ..... result in galaxies merging, may ..... episodes of ..... increased star formation, producing what is called a starburst galaxy. Small galaxies that lack a .... could also be referred to as irregular galaxies.

http://en.wikipedia.org/wiki/Galaxy

apparent	categorized	coherent	induce	interactions
significantly	structure	ultimately	visual	

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5.2 Academic Words Gap-Fill Exercises

This unit contains paragraphs that are not to be found in any other unit of the textbook. The academic words have all been blanked out.

Exercise

Read the texts below. Fill in the blanks from the Academic Word List words below.

1 Silicon is the most common metalloid. It is a ...., which has the ..... Si and atomic number 14. A tetravalent metalloid, silicon is less ..... than its analog carbon.

http://en.wikipedia.org/wiki/Silicon

chemical	element	reactive	symbol

2 Gorillas are the largest of the living primates. They are ground-dwelling and ..... herbivorous. They inhabit the forests of central Africa. Gorillas are divided into two species and (still under ..... as of 2008) either four or five subspecies. The DNA of gorillas is 98 to 99 .... to that of a human, and they are the next closest living relatives to humans after the two chimpanzee species.

http://en.wikipedia.org/wiki/Gorilla

debate	identical	percent	predominantly

3 A photovoltaic module or photovoltaic panel is a packaged interconnected ..... of photovoltaic cells, also known as solar cells. The photovoltaic module, known more commonly as the solar ....., is then used as a ..... in a larger photovoltaic system to offer

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electricity for commercial and ..... applications.

http://en.wikipedia.org/wiki/Solar_panel

assembly	component	panel	residential

4 Physics is a natural science; it is the study of matter and its motion through spacetime and all that ..... from these, such as ..... and force. More broadly, it is the general ..... of nature ..... in order to understand how the world and universe behave.

http://en.wikipedia.org/wiki/Physics

analysis	conducted	derives	energy

5 Robotics is the engineering science and ..... of robots, and their ....., manufacture, application, and ..... disposition. Robotics is related to electronics, mechanics, and software. The word robot was introduced to the public by Czech writer Karel Čapek in his play R.U.R. (Rossum's Universal Robots), ... in 1920. The term "robotics" was coined by Isaac Asimov in his 1941 science fiction short-story "Liar!"

http://en.wikipedia.org/wiki/Robotics

design	published	structural	technology

6 Sesame (Sesamum indicum) is a flowering plant in the genus Sesamum. Numerous wild relatives ..... in Africa and a smaller number in India. It is widely naturalized in tropical ..... around the world and is cultivated for its edible seeds, which grow in pods. The flowers of the sesame seed plant are yellow, though they can ..... in colour with some being blue or purple. It is an ..... plant growing to 50 to 100 cm

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tall, with opposite leaves 4 to 14 cm long.

http://en.wikipedia.org/wiki/Sesame

annual	occur	regions	vary

7 Wine is an alcoholic beverage typically made of fermented grape juice.The natural ..... balance of grapes is such that they can ferment without the addition of sugars, acids, enzymes or other nutrients. Wine is produced by fermenting crushed grapes using various types of yeast. Yeast ..... the sugars found in the grapes and ..... them into alcohol. Different varieties of grapes and strains of yeasts are used depending on the type of wine being produced. The word "wine" ..... from the Latin vinum, "wine" or "grape vine."

http://en.wikipedia.org/wiki/Wine

chemical	consumes	converts	derives

8 Apple Inc. is an American multinational ..... that ..... and manufactures ..... electronics and ..... software products. The company's best-known hardware products include Macintosh ....., the iPod, the iPhone and the iPad.

http://en.wikipedia.org/wiki/Apple_Inc.

computer	computers	consumer	corporation	designs

9 When leaves appear green, it is because they contain an abundance of chlorophyll. Chlorophyll masks other pigment colors. Anthocyanins, in turn, mask carotenoids. As summer turns to autumn, decreasing light levels cause chlorophyll production to slow. However, the decomposition rate of chlorophyll remains ....., so the green color will fade from the leaves. At the

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same time, anthocyanin production in leaves increases, in ..... to surging sugar concentrations. Leaves containing ..... anthocyanins will appear red. Leaves with good amounts of both anthocyanins and carotenoids will appear orange. Leaves with carotenoids but little or no anthocyanins will appear yellow. In the absence of these pigments, other plant ..... also can ..... leaf color. An example includes tannins, which are responsible for the brownish color of some oak leaves.

http://en.wikipedia.org/wiki/Autumn_leaf_color

affect	chemicals	constant	primarily	response

10 Cheese is a generic term for a ..... group of milk-based food products. Cheese is produced throughout the world in wide-ranging flavors, textures, and forms.

Cheese ..... of proteins and fat from milk, usually the milk of cows, buffalo, goats, or sheep. It is produced by coagulation of the milk protein casein. Typically, the milk is acidified and addition of the enzyme rennet causes coagulation. The solids are separated and pressed into ..... form. Some cheeses have molds on the rind or throughout. Most cheeses melt at cooking temperature.

Hundreds of types of cheese are produced. Their ....., textures and flavors depend on the origin of the milk (including the animal's diet), whether they have been pasteurized, the butterfat content, the bacteria and mold, the ....., and aging. Herbs, spices, or wood smoke may be used as flavoring agents.

http://en.wikipedia.org/wiki/Cheese

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consists	diverse	final	processing	styles

11 Chocolate ..... a number of raw and ..... foods produced from the seed of the tropical Theobroma cacao tree. Cacao has been cultivated for at least three millennia in Mexico, Central and South America, with its earliest ..... use around 1100 BC. The ..... of the Mesoamerican peoples made chocolate beverages, including the Aztecs, who made it into a beverage known as xocolātl, a Nahuatl word meaning "bitter water". The seeds of the cacao tree have an ..... bitter taste, and must be fermented to develop the flavor.

http://en.wikipedia.org/wiki/Chocolate

comprises	documented	intense	majority	processed

12 In most birds, reptiles, insects, and fish, an egg (Latin, ovum) is the zygote, resulting from fertilization of the ovum. To ..... incubation the egg is usually kept within a favourable temperature ..... as it nourishes and protects the growing embryo. When the embryo is ..... developed it breaks out of the egg in the ..... of hatching. Some embryos have a ..... egg tooth with which to crack or pip the eggshell or covering.

http://en.wikipedia.org/wiki/Egg_(biology)

adequately	enable	process	range	temporary

13 All organisms have many genes ..... to many different biological traits, some of which are immediately ....., such as eye color or number of limbs, and some of which are not, such as blood type or increased risk for ..... diseases, or the thousands of basic biochemical

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..... that ..... life.

http://en.wikipedia.org/wiki/Gene

comprise	corresponding	processes	specific	visible

14 Instinct is the ..... disposition of a living organism toward a particular behavior. The fixed action patterns are unlearned and inherited. The stimuli can be ..... due to imprinting in a sensitive ..... or also genetically fixed. Examples of instinctual fixed action patterns can be observed in the behavior of animals, which perform various activities (sometimes .....) that are not based upon ..... experience, such as reproduction, and feeding among insects.

http://en.wikipedia.org/wiki/Instinct

complex	inherent	period	prior	variable

15 The Parthenon is a temple of the Greek goddess Athena whom the people of Athens considered their protector. Its ..... began in 447BC and completed in 432BC on the Athenian Acropolis, although decorations of the Parthenon continued until 431BC. It is the most important ..... building of ..... Greece, generally considered to be the culmination of the development of the Doric order. Its decorative sculptures are considered one of the high points of Greek art. The Parthenon is regarded as an enduring ..... of ancient Greece and of Athenian democracy, and one of the world's greatest ..... monuments.

http://en.wikipedia.org/wiki/Parthenon

Classical	construction	cultural	surviving	symbol

16 Acid rain is rain or any other form of precipitation that is unusually acidic, i.e.

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elevated levels of hydrogen ions (low pH). It has harmful effects on plants, aquatic animals, and ..... Acid rain is mostly caused by emissions of ..... of sulfur, nitrogen, and carbon which ..... with the water molecules in the atmosphere to produce acids. However, it can also be caused naturally by the splitting of nitrogen ..... by the ..... produced by lightning strikes, or the ..... of sulfur dioxide into the atmosphere by phenomena of volcano eruptions.

http://en.wikipedia.org/wiki/Acid_rain

compounds	compounds	energy	infrastructure	react
release				

17 The biosphere is the .... of all ecosystems. It can also be called the zone of life on Earth. From the broadest biophysiological point of view, the biosphere is the ..... ecological system ..... all living beings and their relationships, including their ..... with the ..... of the lithosphere, hydrosphere, and atmosphere.

http://en.wikipedia.org/wiki/Biosphere

elements	global	global	integrating	interaction
sum				

18 Galileo Galilei (15 February 1564 - 8 January 1642) was an Italian physicist, mathematician, astronomer, and ..... who played a .... in the Scientific ..... His ..... include improvements to the telescope and ..... astronomical observations, and support for Copernicanism.

http://en.wikipedia.org/wiki/Galileo_Galilei

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achievements	consequent	major	philosopher	Revolution
role				

19 Though once abundant over much of Eurasia and North America, the gray wolf inhabits a very small ..... of its former ..... because of ..... destruction of its territory, human encroachment, and the resulting human-wolf ..... that sparked broad extirpation. Even so, the gray wolf is regarded as being of least concern for extinction according to the International Union for Conservation of Nature, when the entire gray wolf population is considered as a whole. Today, wolves are protected in some ....., hunted for sport in others, or may be subject to extermination as ..... threats to livestock and pets.

http://en.wikipedia.org/wiki/Gray_wolf

areas	encounters	perceived	portion	range
widespread				

20 Ozone (O3) is a triatomic molecule, ... of three oxygen atoms. It is an allotrope of oxygen that is much less ..... than the diatomic allotrope (O2). Ozone in the lower atmosphere is an air pollutant with harmful effects on the respiratory systems of animals; however, the ozone ..... in the upper atmosphere is ....., preventing ..... damaging ultraviolet light from reaching the Earth's surface. Ozone is present in low concentrations throughout the Earth's atmosphere. It has many industrial and ..... applications.

http://en.wikipedia.org/wiki/Ozone

beneficial	consisting	consumer	layer	potentially
stable				

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21 Blood is a specialized bodily fluid that delivers necessary substances to the body's cells – such as nutrients and oxygen – and ..... waste products away from those same cells.

In vertebrates, it is composed of blood cells ..... in a liquid called blood plasma. Plasma, which ..... 55% of blood fluid, is mostly water (90% by volume), and contains dissolved proteins, glucose, mineral ions, hormones, carbon dioxide, platelets and blood cells themselves. The blood cells present in blood are mainly red blood cells and white blood cells, including leukocytes and platelets. The most abundant cells in vertebrate blood are red blood cells. These contain hemoglobin, an iron-containing protein, which .... of oxygen by reversibly binding to this respiratory gas and greatly increasing its solubility in blood. In ....., carbon dioxide is almost entirely ..... extracellularly dissolved in plasma as bicarbonate ion.

http://en.wikipedia.org/wiki/Blood

comprises	contrast	facilitates	suspended	transportation
transported	transports			

22 Bones are ..... organs that form part of the endoskeleton of vertebrates. They ..... to move, support, and protect the various organs of the body, produce red and white blood cells and store minerals. Bone tissue is a type of dense connective tissue. Because bones come in a variety of shapes and have a .... and .... they are lightweight, yet strong and hard, in addition to fulfilling their many other .....

http://en.wikipedia.org/wiki/Skeleton

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complex	external	function	functions	internal
rigid	structure			

23 Deoxyribonucleic acid (DNA) is a nucleic acid that contains the genetic ..... used in the development and ..... of all known living organisms and some viruses. The main ..... of DNA molecules is the long-term storage of information. DNA is often compared to a set of blueprints or a recipe, or a ....., since it contains the ..... needed to ..... other ..... of cells, such as proteins and RNA molecules.

http://en.wikipedia.org/wiki/DNA

code	components	construct	functioning	instructions
instructions	role			

24 Leonardo di ser Piero da Vinci, (April 15, 1452 – May 2, 1519), was an Italian polymath: painter, sculptor, architect, musician, scientist, mathematician, engineer, inventor, anatomist, geologist, botanist and writer. Leonardo has often been described as the archetype of the Renaissance man, a man whose unquenchable curiosity was equaled only by his powers of invention. He is widely considered to be one of the greatest painters of all time and perhaps the most ..... talented person ever to have lived. According to art historian Helen Gardner, the ..... and depth of his interests were without ..... and "his mind and personality seem to us superhuman, the man himself mysterious and remote". Marco Rosci points out, however, that while there is much speculation about the man himself, Leonardo's ..... of the world is essentially ..... rather than mysterious, and that the .... he employed were unusual for his time.

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http://en.wikipedia.org/wiki/Leonardo_da_Vinci

diversely	empirical	logical	methods	precedent
scope	vision			

25 The 2009 flu pandemic is a ..... outbreak of a new strain of H1N1 influenza virus, often referred to colloquially as "swine flu". Although the virus, first ..... in April 2009, contains a combination of genes from swine, avian (bird), and human influenza viruses, it cannot be spread by eating pork or pork products. The outbreak began in the state of Veracruz, Mexico, with ..... that there had been an ..... epidemic for months before it was officially recognized as such. The Mexican government closed most of Mexico City's public and private ..... in an attempt to contain the spread of the virus. However the virus continued to spread ....., clinics in some ..... were overwhelmed by people infected, and the World Health Organization (WHO) and US Centers for Disease Control (CDC) stopped counting cases and in June declared the outbreak to be a pandemic.

http://en.wikipedia.org/wiki/2009_flu_pandemic

areas	detected	evidence	facilities	global
globally	ongoing			

26 Yeasts are eukaryotic micro-organisms classified in the kingdom Fungi, with about 1,500 species currently described; they ..... fungal ..... in the oceans. Most reproduce asexually by budding, although a few do so by binary fission. Yeasts are unicellular, although some species with yeast forms may become multicellular through the formation of a string of connected budding cells known as pseudohyphae, or false hyphae as seen in most molds. Yeast size can ..... greatly depending on the species, typically measuring 3–4 µm in diameter, although some yeasts can reach over

40 μm.

The yeast species Saccharomyces cerevisiae has been used in baking and fermenting alcoholic beverages for thousands of years. It is also extremely important as a model organism in modern cell biology ....., and is one of the most thoroughly ..... eukaryotic microorganisms. ..... have used it to gather information about the biology of the eukaryotic cell and ..... human biology. Other species of yeast, such as Candida albicans, are opportunistic pathogens and can cause infections in humans. Yeasts have recently been used to ..... electricity in microbial fuel cells, and produce ethanol for the biofuel industry.

http://en.wikipedia.org/wiki/Yeast

diversity	dominate	generate	research	researched
researchers	ultimately	vary		

Note: "μm" stands for micrometre or micron. It equals 1×10^{-6} m. (See appendix 8.7)

27 Electromagnetism is the physics of the electromagnetic field, a field that exerts a force on charged particles and is reciprocally ..... by the presence and motion of such particles. A changing magnetic field produces an electric field (this is the ..... of electromagnetic ....., the basis of operation for electrical generators, ... motors, and transformers). ....., a changing electric field ..... a magnetic field. The magnetic field is produced by the motion of electric charges, i.e., electric current. The magnetic field causes the magnetic force associated with magnets. The .... of electromagnetism led to the development of special relativity by Albert Einstein in 1905; and from this it was shown that magnetic fields and electric fields are ..... with relative

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motion as a four vector.

http://en.wikipedia.org/wiki/Electromagnetism

affected	convertible	generates	implications	induction
induction	phenomenon	similarly	theoretical	

28 The Large Hadron Collider (LHC) is the world's largest and highest-..... particle accelerator, intended to collide opposing particle beams of either protons at an ..... of 7 TeV per particle, or lead nuclei at an ..... of 574 TeV per nucleus. It is expected that it will address the most ..... questions of physics, hopefully allowing progress in understanding the deepest laws of nature. The LHC lies in a tunnel 27 kilometres in circumference, as much as 175 metres beneath the Franco-Swiss border near Geneva, Switzerland.

The Large Hadron Collider was built by the European Organization for .... (CERN) with the intention of testing various ..... of high-energy physics, including the existence of the ..... Higgs boson and of the large family of new particles ..... by supersymmetry. It is ..... by and built in collaboration with over 10,000 scientists and engineers from over 100 countries as well as hundreds of universities and laboratories.

http://en.wikipedia.org/wiki/Large_Hadron_Collider

energy	energy	energy	fundamental	funded
hypothesized	Nuclear	predicted	predictions	Research

Note: "Tev" stands for tera electron volt. Tera means 10^{12}. (See appendix 8.7)

29 π (sometimes written pi) is an ..... number, which means that

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its value cannot be expressed exactly as a fraction m/n, where m and n are integers. ....., its decimal representation never ends or repeats. It is also a transcendental number, which ....., among other things, that no .... of algebraic operations on integers (powers, roots, ..., etc.) can be equal to its value; proving this was a late ..... in mathematical history and a ..... result of 19th century German mathematics. Throughout the history of mathematics, there has been much effort to determine π more ..... and to understand its nature; fascination with the number has even carried over into non-mathematical .....

The Greek letter π, often spelled out pi in a ....., was adopted for the number from the Greek word for perimeter, first by William Jones in 1707, and popularized by Leonhard Euler in 1737.

http://en.wikipedia.org/wiki/Pi

accurately	achievement	consequently	culture	finite
implies	irrational	sequence	significant	sums
text				

30 Marie Skłodowska Curie (7 November 1867 – 4 July 1934) was a physicist and chemist of Polish upbringing and, ..., French citizenship. She was a pioneer in the field of radioactivity, the first person honored with two Nobel Prizes, receiving one in physics and later, one in chemistry. She was the first woman to serve as professor at the University of Paris.

She was born Maria Skłodowska in Warsaw (then Vistula Land, Russian Empire; now Poland) and lived there until she was twenty-four years old. In 1891 she followed her elder sister, Bronisława, to study in Paris, where she ..... her higher degrees and ..... her .....

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scientific work. She ..... the Curie ..... in Paris and Warsaw. Her husband, Pierre Curie, was a Nobel co-laureate of hers, being awarded a Nobel prize in physics at the same time. Her daughter, Irène Joliot-Curie, and son-in-law, Frédéric Joliot-Curie, also received Nobel prizes.

Her ..... include the ..... of a ..... of radioactivity, ... for ..... radioactive isotopes, and the discovery of two new ....., polonium and radium.

http://en.wikipedia.org/wiki/Marie_Curie

achievements	conducted	creation	elements	founded
Institutes	isolating	obtained	subsequent	subsequently
techniques	theory			

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6 Academic Word Definitions Matching - Sublist 1A

Match these words to their definitions.

1	analysis	.....	a	an abstract or general idea
2	approach	.....	b	to send goods to another country
3	area	.....	c	one or more reasons for believing something
4	assessment	.....	d	information from which conclusions may be drawn
5	assume	.....	e	able to be used
6	authority	.....	f	facts which contribute to the result of something
7	available	.....	g	the purpose of something, or the duty of a person
8	benefit	.....	h	the conditions one lives in and their effects
9	concept	.....	i	when you decide the value or quality of something
10	consistent	.....	j	a legal agreement between people or groups
11	constitutional	.....	k	relating to the laws and principles of a government
12	context	.....	l	relating to money or trade
13	contract	.....	m	formed or developed from something else
14	create	.....	n	relating to the management of money
15	data	.....	o	a detailed investigation of the parts of something
16	definition	.....	p	an explanation of a word or phrase
17	derived	.....	q	the situation in which something exists or happens
18	distribution	.....	r	to make something new or invent something
19	economic	.....	s	a standard way of making or doing something
20	environment	.....	t	an advantage or good effect
21	established	.....	u	an expert on a subject
22	estimate	.....	v	the way in which things or people are spread about
23	evidence	.....	w	in agreement with expectations or other facts
24	export	.....	x	accept something to be true without questioning it
25	factors	.....	y	recognized something by saying what it is
26	financial	.....	z	a way of considering or doing something
27	formula	.....	α	conventional or conforming to accepted standards
28	function	.....	β	a guess of the size, number or amount of something
29	identified	.....	γ	money earned by doing work or gained by investing
30	income	.....	δ	a subject or specialization, or part of it

6 Academic Word Definitions Matching - Sublist 1B

Match these words to their definitions.

1	indicate	.....	a	an answer or reaction to a question or statement
2	individual	.....	b	in proportion to a hundred
3	interpretation	.....	c	noticeable, meaningful or important
4	involved	.....	d	to happen, often naturally or unexpectedly
5	issues	.....	e	a geographic or economic area
6	labor	.....	f	to show, point out, or make clear
7	legal	.....	g	a single person or thing when compared to a group
8	legislation	.....	h	almost but not exactly the same
9	major	.....	i	more important than others of the same type
10	method	.....	j	the way parts of a system or object are arranged
11	occur	.....	k	an organized system of accepted knowledge
12	percent	.....	l	relating to one thing and not others
13	period	.....	m	a function or part performed in a specific process
14	policy	.....	n	a series of actions taken to achieve a result
15	principle	.....	o	the cause of something or place it comes from
16	procedure	.....	p	practical work which involves physical effort
17	process	.....	q	related to or allowed by law
18	required	.....	r	a basic generalization that is accepted as true
19	research	.....	s	a course of action intended to achieve a result
20	response	.....	t	any length of time
21	role	.....	u	an established practice or plan of what to do
22	section	.....	v	a way of doing something
23	sector	.....	w	a law or laws created by a government
24	significant	.....	x	a detailed study of a subject
25	similar	.....	y	needed or made necessary
26	source	.....	z	problems that people are thinking or talking about
27	specific	.....	α	an explanation or opinion of what something means
28	structure	.....	β	one among a group of things which may change
29	theory	.....	γ	complicated or difficult to understand
30	variable	.....	δ	a distinct part of something

6 Academic Word Definitions Matching - Sublist 2A

Match these words to their definitions.

1	achieve	.....	a	an act of helping to complete a task
2	acquisition	.....	b	an opinion one reaches after careful consideration
3	administration	.....	c	a specific difference between two similar things
4	affect	.....	d	a plan of something or how its parts are arranged
5	appropriate	.....	e	to organize and perform a specific task
6	aspects	.....	f	the basic principles of a subject of study
7	assistance	.....	g	last
8	categories	.....	h	the act of building something
9	chapter	.....	i	a method of managing the affairs of an organization
10	commission	.....	j	the important or typical parts of something
11	community	.....	k	a statement showing the equivalence of two things
12	complex	.....	l	difficult to understand because of its many parts
13	computer	.....	m	the parts of a problem, situation or task
14	conclusion	.....	n	the groups by which something is classified
15	conduct	.....	o	a powerful effect that something has on a situation
16	consequences	.....	p	a person who buys goods or services
17	construction	.....	q	a special group chosen to consider something
18	consumer	.....	r	to recognize a person's contribution to a task
19	credit	.....	s	damage to a person's body after an accident or attack
20	cultural	.....	t	the center of interest, activity, or attention
21	design	.....	u	to influence or cause something to change
22	distinction	.....	v	a social group of people who live in a particular area
23	elements	.....	w	the undesired results of a particular act or situation
24	equation	.....	x	relating to the customs and beliefs of a certain group
25	evaluation	.....	y	to succeed in reaching a target or aim
26	features	.....	z	the process of getting something
27	final	.....	α	a part of a book or period of time
28	focus	.....	β	suitable or right for a particular purpose or situation
29	impact	.....	γ	a machine which performs calculations automatically
30	injury	.....	δ	judgment of the value or quality of something

6 Academic Word Definitions Matching - Sublist 2B

Match these words to their definitions.

1	institute	.....	a	ordinary or usual
2	investment	.....	b	protection of a person, property or organization
3	items	.....	c	the words printed on a page other than the headings
4	journal	.....	d	a series of questions used to gather personal data
5	maintenance	.....	e	the usual ways or customs of a group of people
6	normal	.....	f	buy
7	obtained	.....	g	to choose, especially after careful consideration
8	participation	.....	h	saw, or generally recognized or believed to be true
9	perceived	.....	i	rules issued by an authority
10	positive	.....	j	a person who lives at a particular place
11	potential	.....	k	the act of taking part or being involved in something
12	previous	.....	l	detailed plans or methods for achieving success
13	primary	.....	m	a geographical or physical area
14	purchase	.....	n	simple past and past participle of seek
15	range	.....	o	came into possession of
16	region	.....	p	with limitations, or available only to a select few
17	regulations	.....	q	a place where something was, is, or will be
18	relevant	.....	r	the act of spending time or money in pursuit of gain
19	resident	.....	s	certain about something
20	resources	.....	t	the act of keeping something in its present state
21	restricted	.....	u	more important than anything else
22	security	.....	v	a publication with a focus on a particular subject
23	sought	.....	w	occurring or existing before something or someone else
24	select	.....	x	correct or suitable for a particular purpose
25	site	.....	y	the capacity to develop, succeed or achieve
26	strategies	.....	z	the upper and lower limits of something
27	survey	.....	α	the things which are part of a list or group
28	text	.....	β	to move from one place to another
29	traditional	.....	γ	money, valuable possessions, or natural materials
30	transfer	.....	δ	an organization that does scientific or educational work

6 Academic Word Definitions Matching - Sublist 3A

Match these words to their definitions.

1	alternative	.....	a	the central or most important part of a system or thing
2	circumstances	.....	b	spoken or written words to express an opinion
3	comments	.....	c	conditions that limit the freedom of a system or thing
4	compensation	.....	d	money received for the loss or damage of something
5	components	.....	e	voluntary agreement or permission
6	consent	.....	f	all the individual parts of a system or thing
7	considerable	.....	g	movement of the body, or management of a group
8	constant	.....	h	unchanging, or happening frequently
9	constraints	.....	i	something different, or a choice of something else
10	contribution	.....	j	an occurrence of something
11	convention	.....	k	to record the details of a process or event
12	coordination	.....	l	the act of finding a logical answer or opinion
13	core	.....	m	existing or occurring at the beginning
14	corporate	.....	n	money available for a specific purpose
15	corresponding	.....	o	large or of noticeable importance
16	criteria	.....	p	similar to or anticipated
17	deduction	.....	q	an outline or basic description of a complex process
18	demonstrate	.....	r	stronger than others of the same group or type
19	document	.....	s	made clear with pictures or examples
20	dominant	.....	t	the act of arriving at a country in order to live there
21	emphasis	.....	u	the conditions which make a situation the way it is
22	ensure	.....	v	money given or part played to achieve a group aim
23	excluded	.....	w	the rules or guidelines to test or evaluate something
24	framework	.....	x	relating to a group, company or corporation
25	funds	.....	y	deliberately didn't include something
26	illustrated	.....	z	a conference, or the accepted way of doing something
27	immigration	.....	α	to show or explain how something works
28	implies	.....	β	suggests something without saying directly
29	initial	.....	γ	the importance or special consideration of something
30	instance	.....	δ	to make certain that something will happen

6 Academic Word Definitions Matching - Sublist 3B

Match these words to their definitions.

1	interaction	.....	a	place, position or coordinates of something
2	justification	.....	b	a relationship involving close cooperation
3	layer	.....	c	of the body, or having material existence
4	link	.....	d	an upper limit of something
5	location	.....	e	bad, less than zero, contradictory, or inconclusive
6	maximum	.....	f	a connection between two things
7	minorities	.....	g	a distinct band, thickness, or level of something
8	negative	.....	h	the end results or consequences of a particular event
9	outcomes	.....	i	the state of being either female or male
10	partnership	.....	j	stated clearly or described accurately
11	philosophy	.....	k	a change in position, direction or conditions
12	physical	.....	l	as much as is needed for a particular purpose
13	proportion	.....	m	a series, or the order in which things are arranged
14	published	.....	n	acceptance or meaningfulness based on reason
15	reaction	.....	o	an organized plan, or an outline of a system or thing
16	registered	.....	p	ways of doing an activity that requires skill
17	reliance	.....	q	behavior or action as a result of a particular event
18	removed	.....	r	groups of people who differ from the larger group
19	scheme	.....	s	the size of something when compared to the whole
20	sequence	.....	t	a system of beliefs that guide one's behavior
21	sex	.....	u	took away
22	shift	.....	v	recorded and accepted by a group or organization
23	specified	.....	w	a piece of work that is either difficult or unpleasant
24	sufficient	.....	x	the tendency to trust in someone or something
25	task	.....	y	a book which is published periodically or as a series
26	technical	.....	z	to explain or show that something is right or fair
27	techniques	.....	α	made known to the public through writing
28	technology	.....	β	the study of practical uses of scientific discoveries
29	validity	.....	γ	communication, or the action of things on each other
30	volume	.....	δ	relating to specialized words of a specific subject

6 Academic Word Definitions Matching - Sublist 4A

Match these words to their definitions.

1	access	.....	a	happening once a year
2	adequate	.....	b	the realization of a plan, idea or policy
3	annual	.....	c	mistake or wrong decision
4	apparent	.....	d	the ability to get to or enter somewhere or something
5	approximated	.....	e	willingness to spend time or energy on something
6	attitudes	.....	f	aspects, or the length, width and height of something
7	attributed	.....	g	able to be understood, or seeming to exist
8	civil	.....	h	gave or allowed someone to do something
9	code	.....	i	without taking notice of or being influenced by
10	commitment	.....	j	of a national, racial, religious or linguistic group
11	communication	.....	k	forced a rule, or made someone accept an idea
12	concentration	.....	l	combination of two or more things into a coherent whole
13	conference	.....	m	a meeting or event with talks about a specific subject
14	contrast	.....	n	therefore, this is the reason why
15	cycle	.....	o	regulations, or a set of symbols that mean something
16	debate	.....	p	relating to home or country
17	despite	.....	q	aims, purposes or targets
18	dimensions	.....	r	feelings or opinions about someone or something
19	domestic	.....	s	a serious discussion involving many people
20	emerged	.....	t	became known, or appeared out of something
21	error	.....	u	the possible consequences an event may bring
22	ethnic	.....	v	indicated the cause of something
23	goals	.....	w	enough or barely enough
24	granted	.....	x	the ability to think or focus carefully about one thing
25	hence	.....	y	came near to, or estimated
26	hypothesis	.....	z	a series of events which repeat in a predictable order
27	implementation	.....	α	an obvious difference between two or more things
28	implications	.....	β	the way living things send messages to each other
29	imposed	.....	γ	an idea based on observation but not yet proven
30	integration	.....	δ	relating to the ordinary people of a country

6 Academic Word Definitions Matching - Sublist 4B

Match these words to their definitions.

1	internal	.....	a	kept or continued to have
2	investigation	.....	b	easy to understand
3	job	.....	c	relating to work
4	label	.....	d	a short description of the main points of something
5	mechanism	.....	e	work or a study of a subject over a period of time
6	obvious	.....	f	a detailed study of examination of a problem or crime
7	occupational	.....	g	to raise someone or something to a higher level
8	option	.....	h	a process or sequence of steps within a system
9	output	.....	i	regular work, a piece of work, a responsibility or a task
10	overall	.....	j	relating to or existing inside
11	parallel	.....	k	coming before something else in time or importance
12	parameters	.....	l	the end product, or the amount of something produced
13	phase	.....	m	a branch of applied mathematics that analyzes data
14	predicted	.....	n	a period of time, especially as part of a series
15	principal	.....	o	the relative position of someone or something
16	prior	.....	p	relating to or conforming to the standards of work
17	professional	.....	q	in general, considering everything
18	project	.....	r	the facts or rules which limit how something is done
19	promote	.....	s	a sequence of similar or related things
20	regime	.....	t	the first, main, or most important
21	resolution	.....	u	the total number or amount of things added together
22	retained	.....	v	to give emphasis or special attention to something
23	series	.....	w	information about the object it is fixed to
24	statistics	.....	x	said that something would happen in the future
25	status	.....	y	a particular government or controlling group or system
26	stress	.....	z	a course of action which is decided purposefully
27	subsequent	.....	α	happening after something else
28	sum	.....	β	something available as a choice, or the right to choose
29	summary	.....	γ	done or committed to do with responsibility or effort
30	undertaken	.....	δ	similar, or of equal distance apart along two lengths

6 Academic Word Definitions Matching - Sublist 5A

Match these words to their definitions.

1	academic	.....	a	the maximum that can be contained or produced
2	adjustment	.....	b	substances made up of two or more elements
3	alter	.....	c	a picture in the mind or formed by a mirror or lens
4	amendment	.....	d	relating to or existing outside
5	aware	.....	e	communication, or when people or things touch
6	capacity	.....	f	a gradual process of change, or Darwin's theory
7	challenge	.....	g	to make something possible, practical or easy to do
8	clause	.....	h	things, real or abstract, which exist independently
9	compounds	.....	i	relating to school, college, study or theory
10	conflict	.....	j	making small changes, or becoming suitable
11	consultation	.....	k	to change the form or character of something
12	contact	.....	l	to get weaker or diminish, or to refuse something
13	decline	.....	m	basic, central, or more important than anything else
14	discretion	.....	n	being affected by something in a particular place
15	draft	.....	o	act of forcing something to happen or be accepted
16	enable	.....	p	to make something easy or easier to do
17	energy	.....	q	fighting, or disagreement between people or ideas
18	enforcement	.....	r	a group of words with a meaning, or a legal document
19	entities	.....	s	being equal to or effectively the same as
20	equivalent	.....	t	a change made to the words of a text
21	evolution	.....	u	careful consideration for others, or the right to choose
22	expansion	.....	v	something needing effort in order to be done well
23	exposure	.....	w	a piece of text or plan which is not in its final form
24	external	.....	x	caused something to exist
25	facilitate	.....	y	an increase in size of something
26	fundamental	.....	z	people of the same age, or the production of energy
27	generated	.....	α	power or ability to be physically or mentally active
28	generation	.....	β	having knowledge or being conscious of something
29	image	.....	γ	a meeting to discuss something or seek advice
30	liberal	.....	δ	open minded and tolerant of others, or generous

6 Academic Word Definitions Matching - Sublist 5B

Match these words to their definitions.

1	license	.....	a	to follow, try to get, or try to discover information
2	logic	.....	b	the main or most important, or the best quality
3	marginal	.....	c	a way of looking at or considering something
4	medical	.....	d	able to be continued or maintained
5	mental	.....	e	the replacement of one thing by another
6	modified	.....	f	types, expressions, or ways of doing something
7	monitoring	.....	g	fashion, or change in people's behavior or attitude
8	network	.....	h	income that a company or government receives
9	notion	.....	i	changed just a little and usually for the better
10	objective	.....	j	observing, recording or detecting using instruments
11	orientation	.....	k	financial help to the poor, or health and happiness
12	perspective	.....	l	of the mind
13	precise	.....	m	direction or arrangement, aims, training or preparation
14	prime	.....	n	relating to the study or practice of medicine
15	psychology	.....	o	a process or period in which something changes
16	pursue	.....	p	a legal document giving permission to do or own
17	ratio	.....	q	aim or purpose
18	rejected	.....	r	exact or careful and accurate
19	revenue	.....	s	a way of thinking based on reason
20	stability	.....	t	study of how the mind works and affects behavior
21	styles	.....	u	aim, thing to be aimed at, or who something is for
22	substitution	.....	v	small in amount or effect, or barely acceptable
23	sustainable	.....	w	idea, opinion or belief
24	symbolic	.....	x	refused to accept, make use of, or give affection to
25	target	.....	y	resistance to change, or constancy of character
26	transition	.....	z	a system of things or people which are interconnected
27	trend	.....	α	a comparison of two things expressed as a number
28	version	.....	β	but, compared with the fact that
29	welfare	.....	γ	specific variety, different from others or the original
30	whereas	.....	δ	representing something else, or ineffective

6 Academic Word Definitions Matching - Sublist 6A

Match these words to their definitions.

1	abstract	.....	a	correct and without any mistakes
2	accurate	.....	b	gave someone a task, or sorted something into groups
3	acknowledged	.....	c	biased and unfair treatment of a person or group
4	aggregate	.....	d	a share of something for a specific purpose
5	allocation	.....	e	condition of being male of female
6	assigned	.....	f	all of a person's property or wealth
7	attached	.....	g	added or fixed something to something else
8	author	.....	h	gave no attention to someone or something
9	bond	.....	i	writer
10	brief	.....	j	in addition
11	capable	.....	k	a written summary of the important points of a text
12	cited	.....	l	an amount of money paid for a piece of work or service
13	cooperative	.....	m	having the ability or qualities to do something
14	discrimination	.....	n	relating to a central government
15	display	.....	o	ability to bend, change or be changed
16	diversity	.....	p	short in time, or expressed in a few words
17	domain	.....	q	a person with great skill or knowledge of a subject
18	edition	.....	r	something that encourages or motivates a person to do
19	enhanced	.....	s	show, or arrange something to be seen
20	estate	.....	t	a physical link, or a close social connection
21	exceed	.....	u	to be more than a number, amount or allowed limit
22	expert	.....	v	the total of all the parts
23	explicit	.....	w	clear and detailed, not implicit
24	federal	.....	x	recognized, admitted the truth, or expressed thanks
25	fees	.....	y	willing to help, or involving joint activity
26	flexibility	.....	z	an area of interest, or an area controlled by someone
27	furthermore	.....	α	variety of opinions, styles, social groups or living things
28	gender	.....	β	a version or a batch of a publication in a series
29	ignored	.....	γ	quoted as an example to support an argument
30	incentive	.....	δ	improved in quality, intensity, or value

6 Academic Word Definitions Matching - Sublist 6B

Match these words to their definitions.

1	incidence	.....	a	a lower limit of something
2	incorporated	.....	b	showed or made known
3	index	.....	c	recordings of sound or pictures
4	inhibition	.....	d	an attitude based on probability rather than proof
5	initiatives	.....	e	despite this, nonetheless, notwithstanding
6	input	.....	f	a complete change or the process of change
7	instructions	.....	g	return to normal, or getting back something lost
8	intelligence	.....	h	contribution, or something that goes into a process
9	interval	.....	i	to find or discover by careful searching or research
10	lecture	.....	j	a short period of time between one event and the next
11	migration	.....	k	fundamental, implicit but not obvious, prior
12	minimum	.....	l	reference list arranged alphabetically, or scale
13	ministry	.....	m	movement of a group from one region to another
14	motivation	.....	n	range covered, or opportunity
15	neutral	.....	o	logical or based on reason
16	nevertheless	.....	p	without bias or favoritism, or having no charge
17	overseas	.....	q	an educational speech before an audience or class
18	preceding	.....	r	enthusiasm or reason for doing something
19	presumption	.....	s	abroad, or to, from or in other countries
20	rational	.....	t	occurrence or rate of occurrence of something
21	recovery	.....	u	capacity to acquire and apply knowledge
22	revealed	.....	v	a government department, or the service of a minister
23	scope	.....	w	of lesser importance, a business owned by a parent company
24	subsidiary	.....	x	to carry from one place to another
25	tapes	.....	y	the process of slowing down, restraining, or stopping
26	trace	.....	z	coming before something or someone else
27	transformation	.....	α	usefulness, or public service such as gas or water
28	transport	.....	β	as a corporation, or combined into one thing
29	underlying	.....	γ	information about how to do something
30	utility	.....	δ	introductory steps

6 Academic Word Definitions Matching - Sublist 7A

Match these words to their definitions.

1	adaptation	.....	a	necessary items for a particular activity of purpose
2	adults	.....	b	a way through which something moves or is transmitted
3	advocate	.....	c	to refuse, not admit, or say that something is not true
4	aid	.....	d	based on observation or experiment
5	channel	.....	e	fundamental principle, or establishment
6	chemical	.....	f	traditional, or belonging to ancient Rome or Greece
7	classical	.....	g	to publicly recommend or support something
8	comprehensive	.....	h	to help or support
9	comprise	.....	i	the process of getting rid of something
10	confirmed	.....	j	to classify things or people by quality, rank or level
11	contrary	.....	k	classified by rank or grade
12	converted	.....	l	to get from source, pull out, or get by force
13	couple	.....	m	countable, or having an end or limit
14	decades	.....	n	people or living things that are fully grown or developed
15	definite	.....	o	including many things or everything that is necessary
16	deny	.....	p	changed form, function or opinion
17	differentiation	.....	q	to include or consist of
18	disposal	.....	r	to get rid of, remove, or leave out
19	dynamic	.....	s	a substance with a distinct molecular composition
20	eliminate	.....	t	periods of ten years, or a long time
21	empirical	.....	u	modification to suit new conditions or environment
22	equipment	.....	v	to store in order or record officially
23	extract	.....	w	proved true, or made certain
24	file	.....	x	to link together
25	finite	.....	y	relating to energy, motion, or change
26	foundation	.....	z	certain or clear
27	global	.....	α	relating to the whole world
28	grade	.....	β	to promise or make certain
29	guarantee	.....	γ	not in agreement with, or opposite
30	hierarchical	.....	δ	the process of making something different

6 Academic Word Definitions Matching - Sublist 7B

Match these words to their definitions.

1	identical	.....	a	process of passing or sending something invisible
2	ideology	.....	b	invention or new idea or way of doing something
3	inferred	.....	c	to let go or let out
4	innovation	.....	d	to continue to live or exist
5	insert	.....	e	completely different from anything else
6	intervention	.....	f	prevented, or refused to allow
7	isolated	.....	g	only and exclusively
8	media	.....	h	subject of a text or discussion
9	mode	.....	i	television, radio, newspapers or magazines
10	paradigm	.....	j	what someone has said or written
11	phenomenon	.....	k	model of the essential features of a process or thing
12	priority	.....	l	following in sequence and without a break
13	prohibited	.....	m	conclude from evidence or logical thinking
14	publication	.....	n	become involved in a situation in order to improve it
15	quotation	.....	o	something important that comes first or before others
16	release	.....	p	system of beliefs or principles
17	reverse	.....	q	opposite or back
18	simulation	.....	r	done willingly and without external force
19	solely	.....	s	the same in every way
20	somewhat	.....	t	something unusual or amazing which can be sensed
21	submitted	.....	u	conceptual framework, or an example of something
22	successive	.....	v	presented for consideration, or gave in to
23	survive	.....	w	able to be seen
24	thesis	.....	x	separated, or found the cause of something
25	topic	.....	y	finally and after much trouble or discussion
26	transmission	.....	z	to put something into something else
27	ultimately	.....	α	printed item such as a book, magazine or journal
28	unique	.....	β	manner, way or form
29	visible	.....	γ	long academic paper based on original research
30	voluntary	.....	δ	slightly or rather

6 Academic Word Definitions Matching - Sublist 8A

Match these words to their definitions.

1	abandon	.....	a	movement of people or thing away from a place
2	accompanied	.....	b	to indicate, or act as a symbol for
3	accumulation	.....	c	difference from the norm or what is usual or expected
4	ambiguous	.....	d	collection or process of collecting
5	appendix	.....	e	without need for help, or without thinking
6	appreciation	.....	f	to make better when combined
7	arbitrary	.....	g	good use of resources, or unfair use of people
8	automatically	.....	h	disagreement or incompatibility of two or more things
9	bias	.....	i	existing now, or of the same period
10	chart	.....	j	based on chance rather than reason
11	clarity	.....	k	emphasized or marked as important
12	conformity	.....	l	unfair preference, or distortion of statistics
13	commodity	.....	m	information to aid or advise people about something
14	complement	.....	n	supplementary material at the end of a book
15	contemporary	.....	o	exciting, outstanding, or very sudden
16	contradiction	.....	p	agreement in form or opinion, or doing as others do
17	crucial	.....	q	extremely important
18	currency	.....	r	irregular variations, or rises and falls
19	denote	.....	s	went or came with someone or something
20	detected	.....	t	something that can be bought or sold
21	deviation	.....	u	money or acceptance
22	displacement	.....	v	understood without being said
23	dramatic	.....	w	noticed, or discovered using instruments
24	eventually	.....	x	to show, display or reveal
25	exhibit	.....	y	finally, or ultimately
26	exploitation	.....	z	to leave forever, or to stop something in progress
27	fluctuations	.....	α	to watch carefully or record in detail
28	guidelines	.....	β	recognition of value, or expression of thanks
29	highlighted	.....	γ	not clear, or having two or more possible interpretations
30	implicit	.....	δ	clearness of expression, thought, sound or image

6 Academic Word Definitions Matching - Sublist 8B

Match these words to their definitions.

1	induced	.....	a	relating to a nucleus
2	inevitably	.....	b	caused to happen, or persuaded to do
3	infrastructure	.....	c	basic organization of a system, or public services
4	inspection	.....	d	existing or happening in many places
5	intensity	.....	e	without pattern or plan
6	manipulation	.....	f	a plan of activities organized by time
7	minimized	.....	g	people involved in an activity or job requiring skill
8	nuclear	.....	h	a change of the words of a text
9	offset	.....	i	to return to a previous condition or position
10	paragraph	.....	j	relating to vision or sight
11	plus	.....	k	careful or critical viewing or examination
12	practitioners	.....	l	reduced to a minimum, or made unimportant
13	predominantly	.....	m	as expected, or in a way that can not be avoided
14	prospect	.....	n	almost or practically
15	radical	.....	o	nervousness or uneasiness
16	random	.....	p	by way of, or by means of
17	reinforced	.....	q	strength of concentration of something
18	restore	.....	r	gave support to something
19	revision	.....	s	always the same
20	schedule	.....	t	to counterbalance or compensate one thing for another
21	tension	.....	u	mainly or mostly
22	termination	.....	v	and also, or more, added to
23	theme	.....	w	influence, or control of something using hands
24	thereby	.....	x	end of something, or process of ending something
25	uniform	.....	y	method, or any form of land transport
26	vehicle	.....	z	topic of speech or writing
27	via	.....	α	as a result of this
28	virtually	.....	β	anticipation, or probability of a favorable outcome
29	widespread	.....	γ	fundamental or extreme
30	visual	.....	δ	group of sentences which discuss a single topic

6 Academic Word Definitions Matching - Sublist 9A

Match these words to their definitions.

1	accommodation	.....	a	personal interest, benefit or representation
2	analogous	.....	b	achieved or gained by effort
3	anticipated	.....	c	morally right
4	assurance	.....	d	between two extremes or in the middle
5	attained	.....	e	gave time or effort to a purpose, activity or person
6	behalf	.....	f	relating to, involving or done with hands
7	bulk	.....	g	similar or comparable in some ways
8	ceases	.....	h	adjustment, agreement, or living place
9	coherence	.....	i	started
10	coincide	.....	j	made smaller in size or importance
11	commenced	.....	k	necessary or important to complete a whole
12	incompatible	.....	l	happening at the same time
13	concurrent	.....	m	gradual weakening or damage caused by nature
14	confined	.....	n	scheme or thing invented for a specific purpose
15	controversy	.....	o	limited or enclosed
16	conversely	.....	p	existing as a natural and basic part of something
17	device	.....	q	majority, or large size or weight of something
18	devoted	.....	r	stops something or comes to an end
19	diminished	.....	s	period of time that something lasts
20	distortion	.....	t	discoveries or clear understandings of a complex issue
21	duration	.....	u	unable to exist or work together effectively
22	erosion	.....	v	in the opposite way, on the other hand
23	ethical	.....	w	to happen at the same time, or be similar
24	format	.....	x	change of shape, or inaccurate description or reporting
25	founded	.....	y	logical consistency, or integration of parts
26	inherent	.....	z	arrangement, layout or plan
27	insights	.....	α	brought into existence, or based an idea on something
28	integral	.....	β	promise or confidence
29	intermediate	.....	γ	expected something to happen
30	manual	.....	δ	disagreement or argument about an important topic

6 Academic Word Definitions Matching - Sublist 9B

Match these words to their definitions.

1	mature	.....	a	prior to or in preparation for the main activity or event
2	mediation	.....	b	set of rules and procedures
3	medium	.....	c	completely grown or developed, or like an adult
4	military	.....	d	improve something through small changes
5	minimal	.....	e	action that breaks the rules
6	mutual	.....	f	very small, the smallest possible, or barely enough
7	norms	.....	g	part or share of a whole
8	overlap	.....	h	relating to quality
9	passive	.....	i	correspond or coincide in part with something
10	portion	.....	j	of less importance or lower status
11	preliminary	.....	k	cause, or set off an action or series of actions
12	protocol	.....	l	limitations or controls of the freedom of something
13	qualitative	.....	m	a sudden or important change in a situation
14	refine	.....	n	organized group of people who work cooperatively
15	relaxed	.....	o	negotiation between groups in conflict with each other
16	restraints	.....	p	for a limited period
17	revolution	.....	q	stiff and fixed, or not able to be changed or persuaded
18	rigid	.....	r	sight, mental image, or ability to anticipate the future
19	route	.....	s	means of transmitting, transporting, or communicating
20	scenario	.....	t	imagined event, or model of expected outcomes
21	sphere	.....	u	felt or shared by each other or all
22	subordinate	.....	v	extra, or supplying what is lacking
23	supplementary	.....	w	accepting without resistance, or not active
24	suspended	.....	x	stopped something temporarily or permanently
25	team	.....	y	made rules or controls less severe
26	temporary	.....	z	relating to war or armed forces
27	trigger	.....	α	area of interest, knowledge or control
28	unified	.....	β	way between places, or method of achieving something
29	violation	.....	γ	brought together or combined as a whole
30	vision	.....	δ	accepted or usual standards or ways

6 Academic Word Definitions Matching - Sublist 10

Match these words to their definitions.

1	adjacent	.....	a	used law or power to improve a situation
2	albeit	.....	b	next to, near, or touching
3	assembly	.....	c	met unexpectedly, or experienced something undesired
4	collapse	.....	d	very big
5	colleagues	.....	e	to impose or collect a tax
6	compiled	.....	f	despite this, nevertheless, nonetheless
7	conceived	.....	g	happening soon
8	convinced	.....	h	unwilling or hesitant
9	depression	.....	i	commonly or falsely called
10	encountered	.....	j	although, even though
11	enormous	.....	k	despite this, nevertheless, notwithstanding
12	forthcoming	.....	l	unusual, not even, or irregular
13	inclination	.....	m	basic and essential, or by itself
14	integrity	.....	n	put together from various sources
15	intrinsic	.....	o	to experience or endure
16	invoked	.....	p	people who work or study together at the same place
17	levy	.....	q	unhappiness, or a period of little business activity
18	likewise	.....	r	asked formally, caused a problem, or stayed in position
19	nonetheless	.....	s	a regular meeting of people, or putting parts together
20	notwithstanding	.....	t	gave birth, imagined, or invented
21	odd	.....	u	continuing for a long time, or refusing to give up
22	ongoing	.....	v	by which or through which
23	panel	.....	w	a small group of people chosen to give their opinions
24	persistent	.....	x	in progress or happening now
25	posed	.....	y	persuaded or lead someone to believe or do something
26	reluctant	.....	z	similarly, also
27	so-called	.....	α	easy to understand, or honest and frank
28	straightforward	.....	β	fall down or fail suddenly
29	undergo	.....	γ	slope, or the way a person feels about something
30	whereby	.....	δ	wholeness, honesty, or having principles

7 Supplementary Reading

Read the paragraphs below. What is the topic? What is the main idea?

1 A supermassive black hole is the largest type of black hole in a galaxy, on the order of hundreds of thousands to billions of solar masses. Most, if not all galaxies, including the Milky Way, are believed to contain supermassive black holes at their centers.

http://en.wikipedia.org/wiki/Supermassive_black_hole

topic: .....

topic sentence or main idea:

.....

2 A hydrogen bond is the attractive interaction of a hydrogen atom with an electronegative atom, like nitrogen, oxygen or fluorine. The hydrogen must be covalently bonded to another electronegative atom to create the bond. These bonds can occur between molecules (intermolecularly), or within different parts of a single molecule (intramolecularly). The hydrogen bond (5 to 30 kJ/mole) is stronger than a van der Waals interaction, but weaker than covalent or ionic bonds. This type of bond occurs in both inorganic molecules such as water and organic molecules such as DNA.

http://en.wikipedia.org/wiki/Intermolecular_force

Topic: .....

Topic sentence or main idea:

.....

3 In mathematics, computer science, and related subjects, an algorithm is an effective method for solving a problem using a finite sequence of instructions. Algorithms are used for calculation, data processing, and many other fields.

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http://en.wikipedia.org/wiki/Algorithm

Topic: .....

Topic sentence or main idea:

.....

4 Earth science (also known as geoscience, the geosciences or the Earth sciences), is an all-embracing term for the sciences related to the planet Earth. It is arguably a special case in planetary science, the Earth being the only known life-bearing planet. There are both reductionist and holistic approaches to Earth sciences. The formal discipline of Earth Sciences may include the study of the atmosphere, oceans and biosphere, as well as the solid earth. Typically Earth Scientists will use tools from physics, chemistry, biology, chronology and mathematics to build a quantitative understanding of how the Earth system works, and how it evolved to its current state.

http://en.wikipedia.org/wiki/Earth_science

Topic: .....

Topic sentence or main idea:

.....

5 Green tea contains polyphenols which are thought to improve health, particularly catechins, the most abundant of which is epigallocatechin gallate. In vitro and animal studies as well as preliminary observational and clinical studies of humans suggest that green tea can reduce the risk of cardiovascular disease and cancer as well as beneficially impact bone density, cognitive function, dental cavities, and kidney stones. However, the human studies are sometimes mixed and inconsistent. Green tea also contains carotenoids, tocopherols, ascorbic acid (vitamin C), minerals such as chromium, manganese, selenium or zinc, and certain phytochemical compounds. It is a more potent antioxidant than black tea, although black tea has substances which green tea does not such as theaflavin.

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http://en.wikipedia.org/wiki/Green_tea

Topic: .....

Topic sentence or main idea:

.....

6 The Fibonacci sequence was well known in ancient India, where it was applied to the metrical sciences (prosody), before it was known in Europe. Developments have been attributed to Pingala (200 BC), Virahanka (6th century AD), Gopāla (c.1135 AD), and Hemachandra (c.1150 AD). The motivation came from Sanskrit prosody, where long syllables have duration 2 and short syllables have duration 1. Any pattern of duration n can be formed by adding a short syllable to a pattern of duration n − 1, or a long syllable to a pattern of duration n − 2; thus the prosodists showed that the number of patterns of duration n is the sum of the two previous numbers in the sequence. Later authors gave algorithms for ranking and unranking these patterns (e.g. finding the kth pattern of duration n), and discovered the higher-order Fibonacci numbers. In the West, the sequence was studied by Leonardo of Pisa, known as Fibonacci, in his Liber Abaci (1202). He considers the growth of an idealised (biologically unrealistic) rabbit population, assuming that: a newly-born pair of rabbits, one male, one female, are put in a field; rabbits are able to mate at the age of one month so that at the end of its second month a female can produce another pair of rabbits; rabbits never die and a mating pair always produces one new pair (one male, one female) every month from the second month on. The puzzle that Fibonacci posed was: how many pairs will there be in one year?

http://en.wikipedia.org/wiki/Fibonacci_number

Topic: .....

Topic sentence or main idea:

.....

7 In physics, the wavelength of a sinusoidal wave is the spatial period of the wave – the distance over which the wave's shape repeats. It is usually determined by

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considering the distance between consecutive corresponding points of the same phase, such as crests, troughs, or zero crossings, and is a characteristic of both traveling waves and standing waves, as well as other spatial wave patterns. Wavelength is commonly designated by the Greek letter lambda (λ). The concept can also be applied to periodic waves of non-sinusoidal shape. The term wavelength is also sometimes applied to modulated waves, and to the sinusoidal envelopes of modulated waves or waves formed by interference of several sinusoids.

http://en.wikipedia.org/wiki/Wavelength

Topic: .....

Topic sentence or main idea:

.....

8 The Standard Model of particle physics is a theory of three of the four known fundamental interactions and the elementary particles that take part in these interactions. These particles make up all visible matter in the universe. Every high energy physics experiment carried out since the mid-20th century has eventually yielded findings consistent with the Standard Model. Still, the Standard Model falls short of being a complete theory of fundamental interactions because it does not include gravitation, dark matter, or dark energy. It is not quite a complete description of leptons either, because it does not describe nonzero neutrino masses, although simple natural extensions do.

http://en.wikipedia.org/wiki/Standard_Model

Topic: .....

Topic sentence or main idea:

.....

9 The invention of highly effective "pure distillation" is credited to Arabic and Persian chemists in the Middle East from the 8th century. They produced

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distillation processes to isolate and purify chemical substances for industrial purposes such as isolating natural esters (perfumes) and producing pure alcohol. The first among them was Jabir ibn Hayyan, in the 8th century, who is credited with the invention of numerous chemical apparatus and processes that are still in use today. In particular, his alembic was the first still with retorts which could fully purify chemicals, a precursor to the pot still, and its design has served as inspiration for modern micro-scale distillation apparatus such as the Hickman stillhead. The isolation of ethanol (alcohol) as a pure compound through distillation was first achieved by the Arab chemist Al-Kindi. Petroleum was first distilled by the Persian alchemist Muhammad ibn Zakarīya Rāzi in the 9th century, for producing kerosene, while steam distillation was invented by Avicenna in the early 11th century, for producing essential oils.

http://en.wikipedia.org/wiki/Distillation

Topic: .....

Topic sentence or main idea:

.....

10 The reason for a green flash lies in refraction of light (as in a prism) in the atmosphere: light moves more slowly in the lower, denser air than in the thinner air above, so sunlight rays follow paths that curve slightly, in the same direction as the curvature of the Earth. Higher frequency light (green/blue) curves more than lower frequency light (red/orange), so green/blue rays from the upper limb of the setting sun remain visible after the red rays are obstructed by the curvature of the earth.

http://en.wikipedia.org/wiki/Green_flash

Topic: .....

Topic sentence or main idea:

.....

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11 In biology, epigenetics is the study of changes in phenotype (appearance) or gene expression caused by mechanisms other than changes in the underlying DNA sequence, hence the name epi- (Greek: over, above) -genetics. These changes may remain through cell divisions for the remainder of the cell's life and may also last for multiple generations. However, there is no change in the underlying DNA sequence of the organism; instead, non-genetic factors cause the organism's genes to behave (or express themselves) differently.

http://en.wikipedia.org/wiki/Epigenetics

Topic: .....

Topic sentence or main idea:

.....

12 In aerobic organisms, the citric acid cycle is part of a metabolic pathway involved in the chemical conversion of carbohydrates, fats and proteins into carbon dioxide and water to generate a form of usable energy. Other relevant reactions in the pathway include those in glycolysis and pyruvate oxidation before the citric acid cycle, and oxidative phosphorylation after it. In addition, it provides precursors for many compounds including some amino acids and is therefore functional even in cells performing fermentation.

http://en.wikipedia.org/wiki/Citric_acid_cycle

Topic: .....

Topic sentence or main idea:

.....

13 Like extant organisms, fossils vary in size from microscopic, such as single bacterial cells only one micrometer in diameter, to gigantic, such as dinosaurs and trees many meters long and weighing many tons. A fossil normally preserves only a portion of the deceased organism, usually that portion that was partially mineralized during life, such as the bones and teeth of vertebrates,

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or the chitinous exoskeletons of invertebrates. Preservation of soft tissues is rare in the fossil record. Fossils may also consist of the marks left behind by the organism while it was alive, such as the footprint or feces (coprolites) of a reptile. These types of fossil are called trace fossils (or ichnofossils), as opposed to body fossils. Finally, past life leaves some markers that cannot be seen but can be detected in the form of biochemical signals; these are known as chemofossils or biomarkers.

http://en.wikipedia.org/wiki/Fossil

Topic: .....

Topic sentence or main idea:

.....

14 Language acquisition is the process by which humans acquire the capacity to perceive, produce and use words to understand and communicate. This capacity involves the picking up of diverse capacities including syntax, phonetics, and an extensive vocabulary. This language might be vocal as with speech or manual as in sign. Language acquisition usually refers to first language acquisition, which studies infants' acquisition of their native language, rather than second language acquisition that deals with acquisition in both children and adults of additional languages.

http://en.wikipedia.org/wiki/Language_acquisition

Topic: .....

Topic sentence or main idea:

.....

15 The most widely known anecdote about Archimedes tells of how he invented a method for determining the volume of an object with an irregular shape. According to Vitruvius, a new crown in the shape of a laurel wreath had been made for King Hiero II, and Archimedes was asked to determine whether it

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was of solid gold, or whether silver had been added by a dishonest goldsmith. Archimedes had to solve the problem without damaging the crown, so he could not melt it down into a regularly shaped body in order to calculate its density. While taking a bath, he noticed that the level of the water in the tub rose as he got in, and realized that this effect could be used to determine the volume of the crown. For practical purposes water is incompressible, so the submerged crown would displace an amount of water equal to its own volume. By dividing the weight of the crown by the volume of water displaced, the density of the crown could be obtained. This density would be lower than that of gold if cheaper and less dense metals had been added. Archimedes then took to the streets naked, so excited by his discovery that he had forgotten to dress, crying "Eureka!", meaning "I have found it!"

http://en.wikipedia.org/wiki/Archimedes

Topic: .....

Topic sentence or main idea:

.....

16 No clear relationship has been proven between diet and gallstone formation. However, low-fibre, high-cholesterol diets, and diets high in starchy foods have been suggested as contributing to gallstone formation. Other nutritional factors that may increase risk of gallstones include rapid weight loss, constipation, eating fewer meals per day, eating less fish, and low intakes of the nutrients folate, magnesium, calcium, and vitamin C. On the other hand, wine and whole grain bread may decrease the risk of gallstones.

http://en.wikipedia.org/wiki/Gallstone

Topic: .....

Topic sentence or main idea:

.....

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17 A typical neutron star has a mass between 1.35 and about 2.1 solar masses, with a corresponding radius of about 12 km. In contrast, the Sun's radius is about 60,000 times that. Neutron stars have overall densities of 2.6×10^{14} to 4.1×10^{14} times the density of the sun, which compares with the approximate density of an atomic nucleus of 3×10^{17} kg/m^3. The neutron star's density varies from below 1×10^{9} kg/m^3 in the crust increasing with depth to above 6×10^{17} or 8×10^{17} kg/m^3 deeper inside. This density is approximately equivalent to the mass of the entire human population compressed into the size of a sugar cube.

http://en.wikipedia.org/wiki/Neutron_star

Topic: .....

Topic sentence or main idea:

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18 Primary production is the production of organic compounds from atmospheric or aquatic carbon dioxide, principally through the process of photosynthesis, with chemosynthesis being much less important. All life on earth is directly or indirectly reliant on primary production. The organisms responsible for primary production are known as primary producers or autotrophs, and form the base of the food chain. In terrestrial ecoregions, these are mainly plants, while in aquatic ecoregions algae are primarily responsible. Primary production is distinguished as either net or gross, the former accounting for losses to processes such as cellular respiration, the latter not.

http://en.wikipedia.org/wiki/Primary_production

Topic: .....

Topic sentence or main idea:

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19 The Fermi paradox is a conflict between an argument of scale and probability and a lack of evidence. A more complete definition could be stated thus: The

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apparent size and age of the universe suggests that many technologically advanced extraterrestrial civilizations ought to exist. However, this hypothesis seems inconsistent with the lack of observational evidence to support it. The first aspect of the paradox, "the argument by scale", is a function of the raw numbers involved: there are an estimated 250 billion (2.5×10^{11}) stars in the Milky Way and 70 sextillion (7×10^{22}) in the visible universe. Even if intelligent life occurs on only a minuscule percentage of planets around these stars, there should still be a great number of civilizations extant in the Milky Way galaxy alone. This argument also assumes the mediocrity principle, which states that Earth is not special, but merely a typical planet, subject to the same laws, effects, and likely outcomes as any other world.

http://en.wikipedia.org/wiki/Fermi_paradox

Topic: .....

Topic sentence or main idea:

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20 In the past, it was most commonly supposed that fleas had evolved from the flies (Diptera), based on similarities of the larvae. Genetic and morphological evidence indicates that they are descendants of the Scorpionfly family Boreidae, which are also flightless; accordingly it is possible that they will eventually be reclassified as a suborder within the Mecoptera. In any case, all these groups seem to represent a clade of closely related insect lineages, for which the names Mecopteroidea and Antliophora have been proposed.

http://en.wikipedia.org/wiki/Flea

Topic: .....

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21 The question of how many quantum numbers are needed to describe any given

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system has no universal answer, although for each system one must find the answer for a full analysis of the system. The dynamics of any quantum system are described by a quantum Hamiltonian, H. There is one quantum number of the system corresponding to the energy, i.e., the eigenvalue of the Hamiltonian. There is also one quantum number for each operator O that commutes with the Hamiltonian (i.e. satisfies the relation OH = HO). These are all the quantum numbers that the system can have. Note that the operators O defining the quantum numbers should be independent of each other. Often there is more than one way to choose a set of independent operators. Consequently, in different situations different sets of quantum numbers may be used for the description of the same system.

http://en.wikipedia.org/wiki/Quantum_number

Topic: .....

Topic sentence or main idea:

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22 In 1916, G.N. Lewis proposed that a chemical bond forms by the interaction of two shared bonding electrons, with the representation of molecules as Lewis structures. In 1927 the Heitler-London theory was formulated which for the first time enabled the calculation of bonding properties of the hydrogen molecule H2 based on quantum mechanical considerations. Specifically, Walter Heitler determined how to use Schrödinger's wave equation (1925) to show how two hydrogen atom wavefunctions join together, with plus, minus, and exchange terms, to form a covalent bond. He then called up his associate Fritz London and they worked out the details of the theory over the course of the night. Later, Linus Pauling used the pair bonding ideas of Lewis together with Heitler-London theory to develop two other key concepts in valence bond theory: resonance (1928) and orbital hybridization (1930). According to Charles Coulson, author of the noted 1952 book *Valence*, this period marks the start of "modern valence bond theory", as contrasted with older valence bond theories, which are essentially electronic theories of valence couched in pre-wave-mechanical terms. Resonance theory was criticized as imperfect by Soviet chemists during the 1950's.

http://en.wikipedia.org/wiki/Chemical_bond

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23 Fish oil is oil derived from the tissues of oily fish. It is recommended for a healthy diet because it contains the omega-3 fatty acids, eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA), precursors to eicosanoids that reduce inflammation throughout the body. Fish do not actually produce omega-3 fatty acids, but instead accumulate them from either consuming microalgae that produce these fatty acids, as is the case with fish like herring and sardines, or, as is the case with fatty predatory fish, by eating prey fish that have accumulated omega-3 fatty acids from microalgae. Such fatty predatory fish like mackerel, lake trout, flounder, albacore tuna and salmon may be high in omega-3 fatty acids, but due to their position at the top of the food chain, these species can accumulate toxic substances (see biomagnification). For this reason, the FDA recommends limiting consumption of certain (predatory) fish species (e.g. albacore tuna, shark, and swordfish) due to high levels of toxic contaminants such as mercury, dioxin, PCBs and chlordane.More than 50 percent of the world fish oil production is fed to farmed salmon.There are DHA Omega-3 vegetarian products, made from algae, available if toxic contaminants are of concern.

http://en.wikipedia.org/wiki/Fish_oil

Topic: .....

Topic sentence or main idea:

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24 In organic chemistry, the structures of some rings of atoms are unexpectedly stable. Aromaticity is a chemical property in which a conjugated ring of unsaturated bonds, lone pairs, or empty orbitals exhibit a stabilization stronger than would be expected by the stabilization of conjugation alone. It can also be considered a manifestation of cyclic delocalization and of resonance.

http://en.wikipedia.org/wiki/Aromaticity

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25 Each chemical species (for example, "water molecules", "sodium ions", "electrons", etc.) has an electrochemical potential (a number with units of energy) at any given location, that represents how easy or difficult it is to add more of that species to that location. If possible, a species will try to move from areas with higher electrochemical potential to areas with lower electrochemical potential; in equilibrium, the electrochemical potential will be constant everywhere for each species (it may have a different value for different species). For example, if a glass of water has sodium ions (Na+) dissolved uniformly in it, and an electric field is applied across the water, then the sodium ions will tend to get pulled by the electric field towards one side. We say the ions have electric potential energy, and are moving to lower their potential energy. Likewise, if a glass of water has a lot of dissolved sugar on one side and none on the other side, each sugar molecule will randomly diffuse around the water, until there is equal concentration of sugar everywhere. We say that the sugar molecules have a "chemical potential" which is higher in the high-concentration areas, and the molecules move to lower their chemical potential. These two examples show that an electrical potential and a chemical potential can both give the same result: A redistribution of the chemical species. Therefore it makes sense to combine them into a single "potential", the electrochemical potential, which can directly give the net redistribution taking both into account.

http://en.wikipedia.org/wiki/Electrochemical_potential

Topic: .....

Topic sentence or main idea:

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26 For most human tasks, real numbers (or even rational numbers) offer an adequate description of data. Fractions such as 2/3 and 1/8 are meaningless to a person counting stones, but essential to a person comparing the sizes of different collections of stones. Negative numbers such as −3 and −5 are

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meaningless when measuring the mass of an object, but essential when keeping track of monetary debits and credits. Similarly, imaginary numbers have essential concrete applications in a variety of sciences and related areas such as signal processing, control theory, electromagnetism, quantum mechanics, cartography, vibration analysis, and many others.

http://en.wikipedia.org/wiki/Imaginary_number

Topic: .....

Topic sentence or main idea:

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27 On 7 January 1610 Galileo observed with his telescope what he described at the time as "three fixed stars, totally invisible by their smallness," all close to Jupiter, and lying on a straight line through it. Observations on subsequent nights showed that the positions of these "stars" relative to Jupiter were changing in a way that would have been inexplicable if they had really been fixed stars. On 10 January Galileo noted that one of them had disappeared, an observation which he attributed to its being hidden behind Jupiter. Within a few days he concluded that they were orbiting Jupiter: He had discovered three of Jupiter's four largest satellites (moons): Io, Europa, and Callisto. He discovered the fourth, Ganymede, on 13 January. Galileo named the four satellites he had discovered Medicean stars, in honour of his future patron, Cosimo II de' Medici, Grand Duke of Tuscany, and Cosimo's three brothers. Later astronomers, however, renamed them the Galilean satellites in honour of Galileo himself.

http://en.wikipedia.org/wiki/Galileo_Galilei

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28 In physical chemistry, the van der Waals force (or van der Waals interaction),

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named after Dutch scientist Johannes Diderik van der Waals, is the attractive or repulsive force between molecules (or between parts of the same molecule) other than those due to covalent bonds or to the electrostatic interaction of ions with one another or with neutral molecules. The term includes: 1) force between permanent dipole and a corresponding induced dipole, and 2) instantaneous induced dipole-dipole forces (London dispersion force). It is also sometimes used loosely as a synonym for the totality of intermolecular forces. Van der Waals forces are relatively weak compared to normal chemical bonds, but play a fundamental role in fields as diverse as supramolecular chemistry, structural biology, polymer science, nanotechnology, surface science, and condensed matter physics. Van der Waals forces define the chemical character of many organic compounds. They also define the solubility of organic substances in polar and non-polar media. In low molecular weight alcohols, the properties of the polar hydroxyl group dominate the weak intermolecular forces of van der Waals. In higher molecular weight alcohols, the properties of the nonpolar hydrocarbon chain(s) dominate and define the solubility. Van der Waals forces grow with the length of the nonpolar part of the substance.

http://en.wikipedia.org/wiki/Van_der_Waals_force

Topic: .....

Topic sentence or main idea:

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29 High oil prices, competing demands between foods and other biofuel sources, and the world food crisis, have ignited interest in algaculture (farming algae) for making vegetable oil, biodiesel, bioethanol, biogasoline, biomethanol, biobutanol and other biofuels, using land that is not suitable for agriculture. Algal fuels have many attractive characteristics: they do not affect fresh water resources, can be produced using ocean and wastewater, and are biodegradable and relatively harmless to the environment if spilled. Algae cost more per unit mass yet can yield over 30 times more energy per unit area than other, second-generation biofuel crops. One biofuels company has claimed that algae can produce more oil in an area the size of a two car garage than a football field of soybeans, because almost the entire algal organism can use sunlight to produce lipids, or oil. The United States Department of Energy estimates that if algae fuel replaced all the petroleum fuel in the United States, it would require 15,000 square miles (40,000 km^2). This is less than 1/7 the area of corn harvested in the United States in 2000.

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http://en.wikipedia.org/wiki/Algae_fuel

Topic: .....

Topic sentence or main idea:

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30 Most photoluminescent events, in which a chemical substrate absorbs and then re-emits a photon of light, are fast, on the order of 10 nanoseconds. However, for light to be absorbed and emitted at these fast time scales, the energy of the photons involved (i.e. the wavelength of the light) must be carefully tuned according to the rules of quantum mechanics to match the available energy states and allowed transitions of the substrate. In the special case of phosphorescence, the absorbed photon energy undergoes an unusual intersystem crossing into an energy state of higher spin multiplicity (see term symbol), usually a triplet state. As a result, the energy can become trapped in the triplet state with only classically "forbidden" transitions available to return to the lower energy state. These transitions, although "forbidden", will still occur in quantum mechanics but are kinetically unfavored and thus progress at significantly slower time scales. Most phosphorescent compounds are still relatively fast emitters, with triplet lifetimes on the order of milliseconds. However, some compounds have triplet lifetimes up to minutes or even hours, allowing these substances to effectively store light energy in the form of very slowly degrading excited electron states. If the phosphorescent quantum yield is high, these substances will release significant amounts of light over long time scales, creating so-called "glow-in-the-dark" materials.

http://en.wikipedia.org/wiki/Phosphorescence

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Topic sentence or main idea:

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8 Appendices

1. **Academic Word List Concise Dictionary**
2. **Academic Word List Family Words**
3. **Logical Connectors**
4. **Signal Words**
5. **Prefixes and Roots**
6. **Suffixes**
7. **Symbols, Units and Constants**

8.1 Academic Word List Concise Dictionary

The Academic Word List words defined here are the most frequent words of each family only, and defined for one function only. All definitions are short. Please bear in mind that many words may have additional meanings to the concise definitions below, and may serve as another function to the one shown below. You should use this dictionary for the purpose it was intended - as a quick reference guide only.

For ease of use, words in bold are the most frequent words of each Academic Word List family. Words in italic are less frequent words of the Academic Word List families.

WORD	DEFINITION	AWL	FUNCTION
abandon	to leave forever, or to stop something in progress	8	verb
abstract	a written **summary** of the important points of a **text**	6	noun
academic	relating to school, college, study or **theory**	5	adjective
access	the ability to get to or enter somewhere or something	4	noun
accommodation	**adjustment**, agreement, or living place	9	noun
accompanied	went or came with someone or something	8	verb
accumulation	collection or **process** of collecting	8	noun
accurate	correct and without any mistakes	6	adjective
achieve	to succeed in reaching a **target** or aim	2	verb
acknowledged	recognized, admitted the truth, or expressed thanks	6	verb
acquisition	the **process** of getting something	2	noun
adaptation	*modification* to suit new conditions or **environment**	7	noun
adequate	enough or barely enough	4	adjective
adjacent	next to, near, or touching	10	adjective
adjustment	making small changes, or becoming suitable	5	noun
administration	a **method** of managing the affairs of an organization	2	noun
adults	people or living things that are fully grown or developed	7	noun
advocate	to publicly recommend or support something	7	verb
affect	to influence or cause something to change	2	verb
aggregate	the total of all the parts	6	noun
aid	to help or support	7	verb
albeit	although, even though	10	conjunction
allocation	a share of something for a **specific** purpose	6	noun
alter	to change the form or character of something	5	verb
alternative	something different, or a choice of something else	3	noun
ambiguous	not clear, or having two or more possible *interpretations*	8	adjective
amendment	a change made to the words of a **text**	5	noun
analogous	**similar** or comparable in some ways	9	adjective
analysis	a detailed **investigation** of the parts of something	1	noun
annual	happening once a year	4	adjective
anticipated	expected something to happen	9	verb
apparent	able to be understood, or seeming to exist	4	adjective
appendix	**supplementary** material at the end of a book	8	noun

appreciation	recognition of value, or expression of thanks	8	noun
approach	a way of considering or doing something	1	noun
appropriate	suitable or right for a particular purpose or situation	2	adjective
approximated	came near to, or *estimated*	4	verb
arbitrary	based on chance rather than reason	8	adjective
area	a subject or specialization, or part of it	1	noun
aspects	the parts of a problem, situation or **task**	2	noun
assembly	a regular meeting of people, or putting parts together	10	noun
assessment	when you decide the value or quality of something	1	noun
assigned	gave someone a **task**, or sorted something into groups	6	verb
assistance	an act of helping to complete a **task**	2	noun
assume	accept something to be true without questioning it	1	verb
assurance	promise or confidence	9	noun
attached	added or fixed something to something else	6	verb
attained	*achieved* or gained by effort	9	verb
attitudes	feelings or opinions about someone or something	4	noun
attributed	*indicated* the cause of something	4	verb
author	writer	6	noun
authority	an **expert** on a subject	1	noun
automatically	without need for help, or without thinking	8	adverb
available	able to be used	1	adjective
aware	having knowledge or being conscious of something	5	verb
behalf	personal interest, **benefit** or representation	9	noun
benefit	an advantage or good effect	1	noun
bias	unfair preference, or **distortion** of **statistics**	8	noun
bond	a **physical link**, or a close social connection	6	noun
brief	short in time, or expressed in a few words	6	adjective
bulk	*majority*, or large size or weight of something	9	noun
capable	having the ability or qualities to do something	6	adjective
capacity	the **maximum** that can be contained or produced	5	noun
categories	the groups by which something is classified	2	noun
ceases	stops something or comes to an end	9	verb
challenge	something needing effort in order to be done well	5	noun
channel	a way through which something moves or is *transmitted*	7	noun
chapter	a part of a book or **period** of time	2	noun
chart	to watch carefully or record in detail	8	verb
chemical	a substance with a *distinct* molecular composition	7	noun
circumstances	the conditions which make a situation the way it is	3	noun
cited	*quoted* as an example to support an argument	6	verb
civil	relating to the ordinary people of a country	4	adjective
clarity	clearness of expression, thought, sound or **image**	8	noun
classical	**traditional**, or belonging to ancient Rome or Greece	7	adjective
clause	a group of words with a meaning, or a **legal document**	5	noun
code	**regulations**, or a set of *symbols* that mean something	4	noun
coherence	*logical consistency*, or **integration** of parts	9	noun
coincide	to happen at the same time, or be **similar**	9	verb
collapse	fall down or fail suddenly	10	verb
colleagues	people who work or study together at the same place	10	noun
commenced	started	9	verb
comments	spoken or written words to express an opinion	3	noun

commission	a special group chosen to consider something	2	noun
commitment	willingness to spend time or **energy** on something	4	noun
commodity	something that can be bought or sold	8	noun
communication	the way living things send messages to each other	4	noun
community	a social group of people who live in a particular **area**	2	noun
compensation	money received for the loss or damage of something	3	noun
compiled	put together from various *sources*	10	verb
complement	to make better when combined	8	verb
complex	difficult to understand because of its many parts	2	adjective
components	all the **individual** parts of a system or thing	3	noun
compounds	substances made up of two or more **elements**	5	noun
comprehensive	including many things or everything that is necessary	7	adjective
comprise	to include or consist of	7	verb
computer	a machine which performs calculations **automatically**	2	noun
conceived	gave birth, imagined, or invented	10	verb
concentration	the ability to think or **focus** carefully about one thing	4	noun
concept	an **abstract** or general idea	1	noun
conclusion	an opinion one reaches after careful consideration	2	noun
concurrent	happening at the same time	9	adjective
conduct	to organize and perform a **specific task**	2	verb
conference	a meeting or event with talks about a **specific** subject	4	noun
confined	limited or enclosed	9	verb
confirmed	proved true, or made certain	7	verb
conflict	fighting, or disagreement between people or ideas	5	noun
conformity	agreement in form or opinion, or doing as others do	8	noun
consent	**voluntary** agreement or permission	3	noun
consequences	the undesired results of a particular act or situation	2	noun
considerable	large or of noticeable importance	3	adjective
consistent	in agreement with expectations or other facts	1	adjective
constant	unchanging, or happening frequently	3	adjective
constitutional	relating to the laws and *principles* of a government	1	adjective
constraints	conditions that limit the freedom of a system or thing	3	noun
construction	the act of building something	2	noun
consultation	a meeting to discuss something or *seek* advice	5	noun
consumer	a person who buys goods or services	2	noun
contact	**communication**, or when people or things touch	5	noun
contemporary	existing now, or of the same **period**	8	adjective
context	the situation in which something exists or happens	1	noun
contract	a **legal** agreement between people or groups	1	noun
contradiction	disagreement or *incompatibility* of two or more things	8	noun
contrary	not in agreement with, or opposite	7	adjective
contrast	an **obvious** difference between two or more things	4	noun
contribution	money given or part played to **achieve** a group aim	3	noun
controversy	disagreement or argument about an important **topic**	9	noun
convention	a **conference**, or the accepted way of doing something	3	noun
conversely	in the opposite way, on the other hand	9	adverb
converted	changed form, **function** or opinion	7	verb
convinced	persuaded or lead someone to believe or do something	10	verb
cooperative	willing to help, or *involving* joint activity	6	adjective
coordination	movement of the body, or management of a group	3	noun

core	the central or most important part of a system or thing	3	noun
corporate	relating to a group, company or corporation	3	adjective
corresponding	**similar** to or **anticipated**	3	adjective
couple	to **link** together	7	verb
create	to make something new or invent something	1	verb
credit	to recognize a person's **contribution** to a **task**	2	verb
criteria	the rules or **guidelines** to test or *evaluate* something	3	noun
crucial	extremely important	8	adjective
cultural	relating to the customs and beliefs of a certain group	2	adjective
currency	money or acceptance	8	noun
cycle	a **series** of events which repeat in a *predictable* order	4	noun
data	information from which *conclusions* may be drawn	1	noun
debate	a serious discussion *involving* many people	4	noun
decades	*periods* of ten years, or a long time	7	noun
decline	to get weaker or *diminish*, or to refuse something	5	verb
deduction	the act of finding a *logical* answer or opinion	3	noun
definite	certain or clear	7	adjective
definition	an explanation of a word or phrase	1	noun
demonstrate	to show or explain how something works	3	verb
denote	to **indicate**, or act as a *symbol* for	8	verb
deny	to refuse, not admit, or say that something is not true	7	verb
depression	unhappiness, or a **period** of little business activity	10	noun
derived	formed or developed from something else	1	adjective
design	a plan of something or how its parts are arranged	2	noun
despite	without taking notice of or being influenced by	4	preposition
detected	noticed, or discovered using instruments	8	verb
deviation	difference from the *norm* or what is usual or expected	8	noun
device	**scheme** or thing invented for a **specific** purpose	9	noun
devoted	gave time or effort to a purpose, activity or person	9	verb
differentiation	the **process** of making something different	7	noun
dimensions	**aspects**, or the length, width and height of something	4	noun
diminished	made smaller in size or importance	9	verb
discretion	careful consideration for others, or the right to choose	5	noun
discrimination	*biased* and unfair treatment of a person or group	6	noun
displacement	movement of people or thing away from a place	8	noun
display	show, or arrange something to be seen	6	verb
disposal	the **process** of getting rid of something	7	noun
distinction	a **specific** difference between two **similar** things	2	noun
distortion	change of shape, or *inaccurate* description or reporting	9	noun
distribution	the way in which things or people are spread about	1	noun
diversity	variety of opinions, **styles**, social groups or living things	6	noun
document	to record the details of a **process** or event	3	verb
domain	an **area** of interest, or an area controlled by someone	6	noun
domestic	relating to home or country	4	adjective
dominant	stronger than others of the same group or type	3	adjective
draft	a piece of **text** or plan which is not in its **final** form	5	noun
dramatic	exciting, outstanding, or very sudden	8	adjective
duration	**period** of time that something lasts	9	noun
dynamic	relating to **energy**, motion, or change	7	adjective
economic	relating to money or trade	1	adjective

edition	a **version** or a batch of a **publication** in a **series**	6	noun
elements	the basic *principles* of a subject of study	2	noun
eliminate	to get rid of, *remove*, or leave out	7	verb
emerged	became known, or appeared out of something	4	verb
emphasis	the importance or special consideration of something	3	noun
empirical	based on observation or experiment	7	adjective
enable	to make something possible, practical or easy to do	5	verb
encountered	met unexpectedly, or experienced something undesired	10	verb
energy	power or ability to be *physically* or *mentally* active	5	noun
enforcement	act of forcing something to happen or be accepted	5	noun
enhanced	improved in quality, **intensity**, or value	6	adjective
enormous	very big	10	adjective
ensure	to make certain that something will happen	3	verb
entities	things, real or **abstract**, which exist independently	5	noun
environment	the conditions one lives in and their effects	1	noun
equation	a statement showing the *equivalence* of two things	2	noun
equipment	necessary **items** for a particular activity of purpose	7	noun
equivalent	being equal to or effectively the same as	5	adjective
erosion	gradual weakening or damage caused by nature	9	noun
error	mistake or wrong decision	4	noun
established	*conventional* or *conforming* to accepted standards	1	adjective
estate	all of a person's property or wealth	6	noun
estimate	a guess of the size, number or amount of something	1	noun
ethical	morally right	9	adjective
ethnic	of a national, racial, religious or linguistic group	4	adjective
evaluation	judgment of the value or quality of something	2	noun
eventually	*finally*, or **ultimately**	8	adverb
evidence	one or more reasons for believing something	1	noun
evolution	a gradual **process** of change, or Darwin's **theory**	5	noun
exceed	to be more than a number, amount or allowed limit	6	verb
excluded	deliberately didn't include something	3	verb
exhibit	to show, **display** or *reveal*	8	verb
expansion	an increase in size of something	5	noun
expert	a person with great skill or knowledge of a subject	6	noun
explicit	clear and detailed, not **implicit**	6	adjective
exploitation	good use of **resources**, or unfair use of people	8	noun
export	to send goods to another country	1	verb
exposure	being *affected* by something in a particular place	5	noun
external	relating to or existing outside	5	adjective
extract	to get from **source**, pull out, or get by force	7	verb
facilitate	to make something easy or easier to do	5	verb
factors	facts which *contribute* to the result of something	1	noun
features	the important or typical parts of something	2	noun
federal	relating to a central government	6	adjective
fees	an amount of money paid for a piece of work or service	6	noun
file	to store in order or record officially	7	verb
final	last	2	adjective
financial	relating to the management of money	1	adjective
finite	countable, or having an end or limit	7	adjective
flexibility	ability to bend, change or be changed	6	noun

fluctuations	irregular *variations*, or rises and falls	8	noun
focus	the center of interest, activity, or attention	2	noun
format	arrangement, layout or plan	9	noun
formula	a standard way of making or doing something	1	noun
forthcoming	happening soon	10	adjective
foundation	**fundamental principle**, or *establishment*	7	noun
founded	brought into existence, or based an idea on something	9	verb
framework	an outline or basic description of a **complex process**	3	noun
function	the purpose of something, or the duty of a person	1	noun
fundamental	basic, central, or more important than anything else	5	adjective
funds	money **available** for a **specific** purpose	3	noun
furthermore	in addition	6	adverb
gender	condition of being male of female	6	noun
generated	caused something to exist	5	verb
generation	people of the same age, or the production of **energy**	5	noun
global	relating to the whole world	7	adjective
goals	aims, purposes or *targets*	4	noun
grade	to classify things or people by quality, rank or level	7	verb
granted	gave or allowed someone to do something	4	verb
guarantee	to promise or make certain	7	verb
guidelines	information to **aid** or advise people about something	8	noun
hence	therefore, this is the reason why	4	adverb
hierarchical	classified by rank or **grade**	7	adjective
highlighted	*emphasized* or marked as important	8	verb
hypothesis	an idea based on observation but not yet proven	4	noun
identical	the same in every way	7	adjective
identified	recognized something by saying what it is	1	verb
ideology	system of beliefs or *principles*	7	noun
ignored	gave no attention to someone or something	6	verb
illustrated	made clear with pictures or examples	3	verb
image	a picture in the mind or formed by a mirror or lens	5	noun
immigration	the act of arriving at a country in order to live there	3	noun
impact	a powerful effect that something has on a situation	2	noun
implementation	the realization of a plan, idea or **policy**	4	noun
implications	the possible **consequences** an event may bring	4	noun
implicit	understood without being said	8	adjective
implies	suggests something without saying directly	3	verb
imposed	forced a rule, or made someone accept an idea	4	verb
incentive	something that encourages or *motivates* a person to do	6	noun
incidence	*occurrence* or rate of *occurrence* of something	6	noun
inclination	slope, or the way a person feels about something	10	noun
income	money earned by doing work or gained by *investing*	1	noun
incompatible	unable to exist or work together effectively	9	adjective
incorporated	as a *corporation*, or combined into one thing	6	adjective
index	reference list arranged alphabetically, or scale	6	noun
indicate	to show, point out, or make clear	1	verb
individual	a single person or thing when compared to a group	1	noun
induced	caused to happen, or persuaded to do	8	verb
inevitably	as expected, or in a way that can not be avoided	8	adverb
inferred	*conclude* from **evidence** or *logical* thinking	7	verb

infrastructure	basic organization of a system, or public services	8	noun
inherent	existing as a natural and basic part of something	9	adjective
inhibition	the **process** of slowing down, *restraining*, or stopping	6	noun
initial	existing or *occurring* at the beginning	3	adjective
initiatives	introductory steps	6	noun
injury	damage to a person's body after an accident or attack	2	noun
innovation	invention or new idea or way of doing something	7	noun
input	**contribution**, or something that goes into a **process**	6	noun
insert	to put something into something else	7	verb
insights	discoveries or clear understandings of a **complex** *issue*	9	noun
inspection	careful or critical viewing or examination	8	noun
instance	an *occurrence* of something	3	noun
institute	an organization that does scientific or educational work	2	noun
instructions	information about how to do something	6	noun
integral	necessary or important to complete a whole	9	adjective
integration	combination of two or more things into a *coherent* whole	4	noun
integrity	wholeness, honesty, or having *principles*	10	noun
intelligence	**capacity** to *acquire* and apply knowledge	6	noun
intensity	strength of **concentration** of something	8	noun
interaction	**communication**, or the action of things on each other	3	noun
intermediate	between two extremes or in the middle	9	adjective
internal	relating to or existing inside	4	adjective
interpretation	an explanation or opinion of what something means	1	noun
interval	a short **period** of time between one event and the next	6	noun
intervention	become **involved** in a situation in order to improve it	7	noun
intrinsic	basic and essential, or by itself	10	adjective
investigation	a detailed study of examination of a problem or crime	4	noun
investment	the act of spending time or money in *pursuit* of gain	2	noun
invoked	used law or power to improve a situation	10	verb
involved	complicated or difficult to understand	1	adjective
isolated	separated, or found the cause of something	7	verb
issues	problems that people are thinking or talking about	1	noun
items	the things which are part of a list or group	2	noun
job	regular work, a piece of work, a responsibility or a **task**	4	noun
journal	a **publication** with a **focus** on a particular subject	2	noun
justification	to explain or show that something is right or fair	3	noun
label	information about the object it is fixed to	4	noun
labor	practical work which *involves* **physical** effort	1	noun
layer	a *distinct* band, thickness, or level of something	3	noun
lecture	an educational speech before an audience or class	6	noun
legal	related to or allowed by law	1	adjective
legislation	a law or laws *created* by a government	1	noun
levy	to *impose* or collect a tax	10	verb
liberal	open minded and tolerant of others, or generous	5	adjective
license	a **legal document** giving permission to do or own	5	noun
likewise	*similarly*, also	10	adverb
link	a connection between two things	3	noun
location	place, position or *coordinates* of something	3	noun
logic	a way of thinking based on reason	5	noun
maintenance	the act of keeping something in its present state	2	noun

major	more important than others of the same type	1	adjective
manipulation	influence, or control of something using hands	8	noun
manual	relating to, *involving* or done with hands	9	adjective
marginal	small in amount or effect, or barely acceptable	5	adjective
mature	completely grown or developed, or like an *adult*	9	adjective
maximum	an upper limit of something	3	noun
mechanism	a **process** or **sequence** of steps within a system	4	noun
media	television, radio, newspapers or magazines	7	noun
mediation	negotiation between groups in **conflict** with each other	9	noun
medical	relating to the study or practice of medicine	5	adjective
medium	means of *transmitting*, *transporting*, or *communicating*	9	noun
mental	of the mind	5	adjective
method	a way of doing something	1	noun
migration	movement of a group from one **region** to another	6	noun
military	relating to war or armed forces	9	adjective
minimal	very small, the smallest possible, or barely enough	9	adjective
minimized	reduced to a **minimum**, or made unimportant	8	verb
minimum	a lower limit of something	6	noun
ministry	a government department, or the service of a *minister*	6	noun
minorities	groups of people who differ from the larger group	3	noun
mode	manner, way or form	7	noun
modified	changed just a little and usually for the better	5	verb
monitoring	observing, recording or *detecting* using instruments	5	noun
motivation	enthusiasm or reason for doing something	6	noun
mutual	felt or shared by each other or all	9	adjective
negative	bad, less than zero, *contradictory*, or *inconclusive*	3	adjective
network	a system of things or people which are interconnected	5	noun
neutral	without **bias** or favoritism, or having no charge	6	adjective
nevertheless	**despite** this, **nonetheless**, **notwithstanding**	6	adverb
nonetheless	**despite** this, **nevertheless**, **notwithstanding**	10	adverb
normal	ordinary or usual	2	adjective
norms	accepted or usual standards or ways	9	noun
notion	idea, opinion or belief	5	noun
notwithstanding	**despite** this, **nevertheless**, **nonetheless**	10	adverb
nuclear	relating to a nucleus	8	adjective
objective	aim or purpose	5	noun
obtained	came into possession of	2	verb
obvious	easy to understand	4	adjective
occupational	relating to work	4	adjective
occur	to happen, often naturally or unexpectedly	1	verb
odd	unusual, not even, or irregular	10	adjective
offset	to counterbalance or *compensate* one thing for another	8	verb
ongoing	in progress or happening now	10	adjective
option	something **available** as a choice, or the right to choose	4	noun
orientation	direction or arrangement, aims, training or preparation	5	noun
outcomes	the end results or **consequences** of a particular event	3	noun
output	the end product, or the amount of something produced	4	noun
overall	in general, considering everything	4	adverb
overlap	*correspond* or **coincide** in part with something	9	verb
overseas	abroad, or to, from or in other countries	6	adverb

panel	a small group of people chosen to give their opinions	10	noun
paradigm	*conceptual* **framework**, or an example of something	7	noun
paragraph	group of sentences which discuss a single **topic**	8	noun
parallel	**similar**, or of equal distance apart along two lengths	4	adjective
parameters	the facts or rules which limit how something is done	4	noun
participation	the act of taking part or being **involved** in something	2	noun
partnership	a relationship *involving* close *cooperation*	3	noun
passive	accepting without resistance, or not active	9	adjective
perceived	saw, or generally recognized or believed to be true	2	verb
percent	in **proportion** to a hundred	1	noun
period	any length of time	1	noun
persistent	continuing for a long time, or refusing to give up	10	adjective
perspective	a way of looking at or considering something	5	noun
phase	a **period** of time, especially as part of a **series**	4	noun
phenomenon	something unusual or amazing which can be sensed	7	noun
philosophy	a system of beliefs that guide one's behavior	3	noun
physical	of the body, or having material existence	3	adjective
plus	and also, or more, added to	8	preposition
policy	an **established** practice or plan of what to do	1	noun
portion	part or share of a whole	9	noun
posed	asked formally, caused a problem, or stayed in position	10	verb
positive	certain about something	2	adjective
potential	the **capacity** to develop, succeed or **achieve**	2	noun
practitioners	people **involved** in an activity or **job** *requiring* skill	8	noun
preceding	coming before something or someone else	6	adjective
precise	exact or careful and **accurate**	5	adjective
predicted	said that something would happen in the future	4	verb
predominantly	mainly or mostly	8	adverb
preliminary	**prior** to or in preparation for the main activity or event	9	adjective
presumption	an *attitude* based on probability rather than proof	6	noun
previous	*occurring* or existing before something or someone else	2	adjective
primary	more important than anything else	2	adjective
prime	the main or most important, or the best quality	5	adjective
principal	the first, main, or most important	4	adjective
principle	a basic generalization that is accepted as true	1	noun
prior	coming before something else in time or importance	4	adjective
priority	something important that comes first or before others	7	noun
procedure	a course of action intended to **achieve** a result	1	noun
process	a **series** of actions taken to **achieve** a result	1	noun
professional	relating to or *conforming* to the standards of work	4	adjective
prohibited	prevented, or refused to allow	7	verb
project	work or a study of a subject over a **period** of time	4	noun
promote	to raise someone or something to a higher level	4	verb
proportion	the size of something when compared to the whole	3	noun
prospect	*anticipation*, or probability of a favorable *outcome*	8	noun
protocol	set of rules and *procedures*	9	noun
psychology	study of how the mind works and *affects* behavior	5	noun
publication	printed *item* such as a book, magazine or **journal**	7	noun
published	made known to the public through writing	3	verb
purchase	buy	2	verb

pursue	to follow, try to get, or try to discover information	5	verb
qualitative	relating to quality	9	adjective
quotation	what someone has said or written	7	noun
radical	**fundamental** or extreme	8	adjective
random	without pattern or plan	8	adjective
range	the upper and lower limits of something	2	noun
ratio	a comparison of two things expressed as a number	5	noun
rational	*logical* or based on reason	6	adjective
reaction	behavior or action as a result of a particular event	3	noun
recovery	return to **normal**, or getting back something lost	6	noun
refine	improve something through small changes	9	verb
regime	a particular government or controlling group or system	4	noun
region	a geographical or **physical area**	2	noun
registered	recorded and accepted by a group or organization	3	adjective
regulations	rules *issued* by an **authority**	2	noun
reinforced	gave support to something	8	verb
rejected	refused to accept, make use of, or give affection to	5	verb
relaxed	made rules or controls less severe	9	verb
release	to let go or let out	7	verb
relevant	correct or suitable for a particular purpose	2	adjective
reliance	the tendency to trust in someone or something	3	noun
reluctant	unwilling or hesitant	10	adjective
removed	took away	3	verb
required	needed or made necessary	1	verb
research	a detailed study of a subject	1	noun
resident	a person who lives at a particular place	2	noun
resolution	a course of action which is decided purposefully	4	noun
resources	money, valuable possessions, or natural materials	2	noun
response	an answer or **reaction** to a question or statement	1	noun
restore	to return to a **previous** condition or position	8	verb
restraints	limitations or controls of the freedom of something	9	noun
restricted	with limitations, or **available** only to a select few	2	adjective
retained	kept or continued to have	4	verb
revealed	showed or made known	6	verb
revenue	**income** that a company or government receives	5	noun
reverse	opposite or back	7	noun
revision	a change of the words of a **text**	8	noun
revolution	a sudden or important change in a situation	9	noun
rigid	stiff and fixed, or not able to be changed or persuaded	9	adjective
role	a **function** or part performed in a **specific process**	1	noun
route	way between places, or **method** of *achieving* something	9	noun
scenario	imagined event, or model of expected **outcomes**	9	noun
schedule	a plan of activities organized by time	8	noun
scheme	an organized plan, or an outline of a system or thing	3	noun
scope	**range** covered, or opportunity	6	noun
section	a *distinct* part of something	1	noun
sector	a geographic or **economic area**	1	noun
security	protection of a person, property or organization	2	noun
select	to choose, especially after careful consideration	2	verb
sequence	a **series**, or the order in which things are arranged	3	noun

series	a **sequence** of **similar** or related things	4	noun
sex	the state of being either female or male	3	noun
shift	a change in position, direction or conditions	3	noun
significant	noticeable, meaningful or important	1	adjective
similar	almost but not exactly the same	1	adjective
simulation	model of the essential **features** of a **process** or thing	7	noun
site	a place where something was, is, or will be	2	noun
so-called	commonly or falsely called	10	adjective
solely	only and exclusively	7	adverb
somewhat	slightly or rather	7	adverb
sought	simple past and past participle of *seek*	2	verb
source	the cause of something or place it comes from	1	noun
specific	relating to one thing and not others	1	adjective
specified	stated clearly or described *accurately*	3	verb
sphere	**area** of interest, knowledge or control	9	noun
stability	resistance to change, or *constancy* of character	5	noun
statistics	a branch of applied mathematics that *analyzes* **data**	4	noun
status	the relative position of someone or something	4	noun
straightforward	easy to understand, or honest and frank	10	adjective
strategies	detailed plans or *methods* for *achieving* success	2	noun
stress	to give **emphasis** or special attention to something	4	verb
structure	the way parts of a system or object are arranged	1	noun
styles	types, expressions, or ways of doing something	5	noun
submitted	presented for consideration, or gave in to	7	verb
subordinate	of less importance or lower **status**	9	adjective
subsequent	happening after something else	4	adjective
subsidiary	of lesser importance, business owned by parent company	6	adjective
substitution	the replacement of one thing by another	5	noun
successive	following in **sequence** and without a break	7	adjective
sufficient	as much as is needed for a particular purpose	3	adjective
sum	the total number or amount of things added together	4	noun
summary	a short description of the main points of something	4	noun
supplementary	extra, or supplying what is lacking	9	adjective
survey	a **series** of questions used to gather personal **data**	2	noun
survive	to continue to live or exist	7	verb
suspended	stopped something *temporarily* or permanently	9	verb
sustainable	able to be continued or *maintained*	5	adjective
symbolic	representing something else, or ineffective	5	adjective
tapes	recordings of sound or pictures	6	noun
target	aim, thing to be aimed at, or who something is for	5	noun
task	a piece of work that is either difficult or unpleasant	3	noun
team	organized group of people who work *cooperatively*	9	noun
technical	relating to specialized words of a **specific** subject	3	adjective
techniques	ways of doing an activity that *requires* skill	3	noun
technology	the study of practical uses of scientific discoveries	3	noun
temporary	for a limited **period**	9	adjective
tension	nervousness or uneasiness	8	noun
termination	end of something, or **process** of ending something	8	noun
text	the words printed on a page other than the headings	2	noun
theme	**topic** of speech or writing	8	noun

theory	an organized system of accepted knowledge	1	noun
thereby	as a result of this	8	adverb
thesis	long **academic** paper based on original **research**	7	thesis
topic	subject of a **text** or discussion	7	noun
trace	to find or discover by careful searching or **research**	6	verb
traditional	the usual ways or customs of a group of people	2	adjective
transfer	to move from one place to another	2	verb
transformation	a complete change or the **process** of change	6	noun
transition	a **process** or **period** in which something changes	5	noun
transmission	process of passing or sending something *invisible*	7	noun
transport	to carry from one place to another	6	verb
trend	fashion, or change in people's behavior or *attitude*	5	noun
trigger	cause, or set off an action or **series** of actions	9	verb
ultimately	*finally* and after much trouble or discussion	7	adverb
undergo	to experience or endure	10	verb
underlying	**fundamental**, **implicit** but not **obvious**, **prior**	6	adjective
undertaken	done or *committed* to do with responsibility or effort	4	verb
unified	brought together or combined as a whole	9	verb
uniform	always the same	8	adjective
unique	completely different from anything else	7	adjective
utility	usefulness, or public service such as gas or water	6	noun
validity	acceptance or meaningfulness based on reason	3	noun
variable	one among a group of things which may change	1	noun
vehicle	**method**, or any form of land **transport**	8	noun
version	**specific** variety, different from others or the original	5	noun
via	by way of, or by means of	8	preposition
violation	action that breaks the rules	9	noun
virtually	almost or practically	8	adverb
visible	able to be seen	7	adjective
vision	sight, **mental image**, or ability to *anticipate* the future	9	noun
visual	relating to *vision* or sight	8	adjective
volume	a book which is **published** *periodically* or as a **series**	3	noun
voluntary	done willingly and without **external** force	7	adjective
welfare	**financial** help to the poor, or health and happiness	5	noun
whereas	but, compared with the fact that	5	conjunction
whereby	by which or through which	10	adverb
widespread	existing or happening in many places	8	adjective

8.2 Academic Word List Family Words

The Academic Word List is a list of 570 headwords and their families that are found frequently in academic texts. For convenience, the list is divided into ten sublists arranged by frequency of occurrence in academic texts. Words within a sublist are arranged alphabetically. These words have been grouped into families; the headword is in *italics* in the column on the left, and its derivations are in the columns to the right. If you know the meaning of the headword, and have a little knowledge of English word suffixes, then you should be able to guess the meaning of most of the words in its family. Each word family has one word that is written in **bold**. This word is the one most commonly found in academic texts compared to others in the same family. Therefore, the most important words of each family are the words in *italic* and **bold**.

Sublist 1

1	*analyze*	analyses	**analysis**	analyst	analysts	analytic
		analytical	analytically	analyze	analyzed	analyzer
		analyzers	analyzes	analyzing		
2	***approach***	approachable	approached	approaches	approaching	unapproachable
3	***area***	areas				
4	*assess*	assessable	assessed	assesses	assessing	**assessment**
		assessments	reassess	reassessed	reassessing	reassessment
		unassessed				
5	***assume***	assumed	assumes	assuming	assumption	assumptions
6	***authority***	authoritative	authorities			
7	***available***	availability	unavailable			
8	***benefit***	beneficial	beneficiary	beneficiaries	benefited	benefiting
		benefits				
9	***concept***	conception	concepts	conceptual	conceptualization	conceptualize
		conceptualized	conceptualizes	conceptualizing	conceptually	
10	*consist*	consisted	consistency	**consistent**	consistently	consisting
		consists	inconsistencies	inconsistency	inconsistent	
11	*constitute*	constituencies	constituency	constituent	constituents	constituted
		constitutes	constituting	constitution	**constitutional**	constitutionally
		constitutions	constitutive	unconstitutional		
12	***context***	contexts	contextual	contextualize	contextualized	contextualizing
13	***contract***	contracted	contracting	contractor	contractors	contracts
14	***create***	created	creates	creating	creation	creations
		creative	creatively	creativity	creator	creators
		recreate	recreated	recreates	recreating	
15	***data***					
16	*define*	definable	defined	defines	defining	**definition**
		definitions	redefine	redefined	redefines	redefining
		undefined				
17	*derive*	derivation	derivations	derivative	derivatives	**derived**
		derives	deriving			
18	*distribute*	distributed	distributing	**distribution**	distributional	distributions

		distributive	distributor	distributors	redistribute	redistributed
		redistributes	redistributing	redistribution		
19	*economy*	**economic**	economical	economically	economics	economies
		economist	economists	uneconomical		
20	***environment***	environmental	environmentalist	environmentalists	environmentally	environments
21	*establish*	disestablish	disestablished	disestablishes	disestablishing	disestablishment
		established	establishes	establishing	establishment	establishments
22	***estimate***	estimated	estimates	estimating	estimation	estimations
		over-estimate	overestimate	overestimated	overestimates	overestimating
		underestimate	underestimated	underestimates	underestimating	
23	*evident*	evidenced	**evidence**	evidential	evidently	
24	***export***	exported	exporter	exporters	exporting	exports
25	*factor*	factored	factoring	**factors**		
26	*finance*	financed	finances	**financial**	financially	financier
		financiers	financing			
27	***formula***	formulae	formulas	formulate	formulated	formulating
		formulation	formulations	reformulate	reformulated	reformulating
		reformulation	reformulations			
28	***function***	functional	functionally	functioned	functioning	functions
29	*identify*	identifiable	identification	**identified**	identifies	identifying
		identities	identity	unidentifiable		
30	***income***	incomes				
31	***indicate***	indicated	indicates	indicating	indication	indications
		indicative	indicator	indicators		
32	***individual***	individualized	individuality	individualism	individualist	individualists
		individualistic	individually	individuals		
33	*interpret*	**interpretation**	interpretations	interpretative	interpreted	interpreting
		interpretive	interprets	misinterpret	misinterpretation	misinterpretations
		misinterpreted	misinterpreting	misinterprets	reinterpret	reinterpreted
		reinterprets	reinterpreting	reinterpretation	reinterpretations	
34	*involve*	**involved**	involvement	involves	involving	uninvolved
35	*issue*	issued	**issues**	issuing		
36	***labor***	labor	labored	labors	labored	laboring
		labors				
37	***legal***	illegal	illegality	illegally	legality	legally
38	*legislate*	legislated	legislates	legislating	**legislation**	legislative
		legislator	legislators	legislature		
39	***major***	majorities	majority			
40	***method***	methodical	methodological	methodologies	methodology	methods
41	***occur***	occurred	occurrence	occurrences	occurring	occurs
		reoccur	reoccurred	reoccurring	reoccurs	
42	***percent***	percentage	percentages			
43	***period***	periodic	periodical	periodically	periodicals	periods
44	***policy***	policies				
45	***principle***	principled	principles	unprincipled		
46	*proceed*	procedural	**procedure**	procedures	proceeded	proceeding
		proceedings	proceeds			
47	***process***	processed	processes	processing		
48	*require*	**required**	requirement	requirements	requires	requiring
49	***research***	researched	researcher	researchers	researches	researching
50	*respond*	responded	respondent	respondents	responding	responds

		response	responses	responsive	responsiveness	unresponsive
51	***role***	roles				
52	***section***	sectioned	sectioning	sections		
53	***sector***	sectors				
54	***significant***	insignificant	insignificantly	significance	significantly	signified
		signifies	signify	signifying		
55	***similar***	dissimilar	similarities	similarity	similarly	
56	***source***	sourced	sources	sourcing		
57	***specific***	specifically	specification	specifications	specificity	specifics
58	***structure***	restructure	restructured	restructures	restructuring	structural
		structurally	structured	structures	structuring	unstructured
59	***theory***	theoretical	theoretically	theories	theorist	theorists
60	*vary*	invariable	invariably	variability	variable	**variables**
		variably	variance	variant	variants	variation
		variations	varied	varies	varying	

Sublist 2

61	***achieve***	achievable	achieved	achievement	achievements	achieves
		achieving				
62	*acquire*	acquired	acquires	acquiring	**acquisition**	acquisitions
63	*administrate*	administrates	**administration**	administrations	administrative	administratively
		administrator	administrators			
64	***affect***	affected	affecting	affective	affectively	affects
		unaffected				
65	***appropriate***	appropriately	appropriateness	inappropriacy	inappropriate	inappropriately
66	*aspect*	**aspects**				
67	*assist*	**assistance**	assistant	assistants	assisted	assisting
		assists	unassisted			
68	*category*	**categories**	categorization	categorize	categorized	categorizes
		categorizing				
69	***chapter***	chapters				
70	***commission***	commissioned	commissioner	commissioners	commissioning	commissions
71	***community***	communities				
73	***complex***	complexities	complexity			
73	*compute*	computation	computational	computations	computable	**computer**
		computed	computerized	computers	computing	
74	*conclude*	concluded	concludes	concluding	**conclusion**	conclusions
		conclusive	conclusively	inconclusive	inconclusively	
75	***conduct***	conducted	conducting	conducts		
76	*consequent*	consequence	**consequences**	consequently		
77	*construct*	constructed	constructing	**construction**	constructions	constructive
		constructs	reconstruct	reconstructed	reconstructing	reconstruction
		reconstructs				
78	*consume*	consumed	**consumer**	consumers	consumes	consuming
		consumption				
79	***credit***	credited	crediting	creditor	creditors	credits
80	*culture*	**cultural**	culturally	cultured	cultures	uncultured
81	***design***	designed	designer	designers	designing	designs
82	*distinct*	**distinction**	distinctions	distinctive	distinctively	distinctly
		indistinct	indistinctly			
83	*element*	**elements**				

84	*equate*	equated	equates	equating	**equation**	equations
85	*evaluate*	evaluated	evaluates	evaluating	**evaluation**	evaluations
		evaluative	reevaluate	reevaluated	reevaluates	reevaluating
		reevaluation				
86	*feature*	featured	**features**	featuring		
87	***final***	finality	finalize	finalized	finalizes	finalizing
		finally	finals			
88	***focus***	focused	focuses	focusing	focused	focusing
		refocus	refocused	refocuses	refocusing	refocused
		refocuses	refocusing			
89	***impact***	impacted	impacting	impacts		
90	*injure*	injured	injures	injuries	injuring	**injury**
		uninjured				
91	***institute***	instituted	institutes	instituting	institution	institutional
		institutionalize	institutionalized	institutionalizes	institutionalizing	institutionally
		institutions				
92	*invest*	invested	investing	**investment**	investments	investor
		investors	invests	reinvest	reinvested	reinvesting
		reinvestment	reinvests			
93	*item*	itemization	itemize	itemized	itemizes	itemizing
		items				
94	***journal***	journals				
95	*maintain*	maintained	maintaining	maintains	**maintenance**	
96	***normal***	abnormal	abnormally	normality	normalization	normalize
		normalized	normalizes	normalizing	normally	
97	*obtain*	obtainable	**obtained**	obtaining	obtains	unobtainable
98	*participate*	participant	participants	participated	participates	participating
		participation	participatory			
99	*perceive*	**perceived**	perceives	perceiving	perception	perceptions
100	***positive***	positively				
101	***potential***	potentially				
102	***previous***	previously				
103	***primary***	primarily				
104	***purchase***	purchased	purchaser	purchasers	purchases	purchasing
105	***range***	ranged	ranges	ranging		
106	***region***	regional	regionally	regions		
107	*regulate*	deregulated	deregulates	deregulating	deregulation	regulated
		regulates	regulating	regulation	**regulations**	regulator
		regulators	regulatory	unregulated		
108	***relevant***	irrelevance	irrelevant	relevance		
109	*reside*	resided	residence	**resident**	residential	residents
		resides	residing			
110	*resource*	resourced	resourceful	**resources**	resourcing	unresourceful
		under-resourced				
111	*restrict*	**restricted**	restricting	restriction	restrictions	restrictive
		restrictively	restricts	unrestricted	unrestrictive	
112	*secure*	insecure	insecurities	insecurity	secured	securely
		secures	securing	securities	**security**	
113	*seek*	seeking	seeks	**sought**		
114	***select***	selected	selecting	selection	selections	selective
		selectively	selector	selectors	selects	

115	***site***	sites				
116	*strategy*	strategic	**strategies**	strategically	strategist	strategists
117	***survey***	surveyed	surveying	surveys		
118	***text***	texts	textual			
119	*tradition*	non-traditional	**traditional**	traditionalist	traditionally	traditions
120	***transfer***	transferable	transference	transferred	transferring	transfers

Sublist 3

121	***alternative***	alternatively	alternatives			
122	*circumstance*	**circumstances**				
123	*comment*	commentaries commenting	commentary **comments**	commentator	commentators	commented
124	*compensate*	compensated compensatory	compensates	compensating	**compensation**	compensations
125	*component*	**components**				
126	***consent***	consensus	consented	consenting	consents	
127	***considerable***	considerably				
128	***constant***	constancy	constantly	constants	inconstancy	inconstantly
129	*constrain*	constrained unconstrained	constraining	constrains	constraint	**constraints**
130	*contribute*	contributed contributor	contributes contributors	contributing	**contribution**	contributions
131	*convene*	**convention** conventionally	convenes conventions	convened unconventional	convening	conventional
132	*coordinate*	coordinated coordinators	coordinates	coordinating	**coordination**	coordinator
133	***core***	cores	coring	cored		
134	***corporate***	corporate	corporation	corporations		
135	*correspond*	corresponded	correspondence	**corresponding**	correspondingly	corresponds
136	***criteria***	criterion				
137	*deduce*	deduced	deduces	deducing	**deduction**	deductions
138	***demonstrate***	demonstrable demonstration demonstrators	demonstrably demonstrations	demonstrated demonstrative	demonstrates demonstratively	demonstrating demonstrator
139	***document***	documentation	documented	documenting	documents	
140	*dominate*	dominance domination	**dominant**	dominated	dominates	dominating
141	***emphasis***	emphasize emphatically	emphasized	emphasizes	emphasizing	emphatic
142	***ensure***	ensured	ensures	ensuring		
143	*exclude*	**excluded** exclusionist	excludes exclusions	excluding exclusive	exclusion exclusively	exclusionary
144	***framework***	frameworks				
145	*fund*	funded	funder	funders	funding	**funds**
146	*illustrate*	**illustrated** illustrative	illustrates	illustrating	illustration	illustrations
147	*immigrate*	immigrant **immigration**	immigrants	immigrated	immigrates	immigrating
148	*imply*	implied	**implies**	implying		
149	***initial***	initially				
150	***instance***	instances				

151	*interact*	interacted	interacting	**interaction**	interactions	interactive
		interactively	interacts			
152	*justify*	justifiable	justifiably	**justification**	justifications	justified
		justifies	justifying	unjustified		
153	***layer***	layered	layering	layers		
154	***link***	linkage	linkages	linked	linking	links
155	*locate*	located	locating	**location**	locations	relocate
		relocated	relocates	relocating	relocation	
156	*maximize*	max	maximization	maximize	maximized	maximizes
		maximizing	**maximum**			
157	*minor*	**minorities**	minority	minors		
158	*negate*	**negative**	negated	negates	negating	negatively
		negatives				
159	*outcome*	**outcomes**				
160	*partner*	partners	**partnership**	partnerships		
161	***philosophy***	philosopher	philosophers	philosophical	philosophically	philosophies
		philosophize	philosophized	philosophizes	philosophizing	
162	***physical***	physically				
163	***proportion***	disproportion	disproportionate	disproportionately	proportional	proportionally
		proportionate	proportionately	proportions		
164	*publish*	**published**	publisher	publishers	publishes	publishing
		unpublished				
165	*react*	reacted	reacts	reacting	**reaction**	reactionaries
		reactionary	reactions	reactive	reactivate	reactivation
		reactor	reactors			
166	*register*	deregister	deregistered	deregistering	deregisters	deregistration
		registered	registering	registers	registration	
167	*rely*	reliability	reliable	reliably	**reliance**	reliant
		relied	relies	relying	unreliable	
168	*remove*	removable	removal	removals	**removed**	removes
		removing				
169	***scheme***	schematic	schematically	schemed	schemes	scheming
170	***sequence***	sequenced	sequences	sequencing	sequential	sequentially
171	***sex***	sexes	sexism	sexual	sexuality	sexually
172	***shift***	shifted	shifting	shifts		
173	*specify*	specifiable	**specified**	specifies	specifying	unspecified
174	***sufficient***	sufficiency	insufficient	insufficiently	sufficiently	
175	***task***	tasks				
176	***technical***	technically				
177	*technique*	**techniques**				
178	***technology***	technological	technologically			
179	*valid*	invalidate	invalidity	validate	validated	validating
		validation	**validity**	validly		
180	***volume***	vol	volumes			

Sublist 4

181	***access***	accessed	accesses	accessibility	accessible	accessing
		inaccessible				
182	***adequate***	adequacy	adequately	inadequacies	inadequacy	inadequate
		inadequately				
183	***annual***	annually				

184	***apparent***	apparently				
185	*approximate*	**approximated**	approximately	approximates	approximating	approximation
		approximations				
186	*attitude*	**attitudes**				
187	*attribute*	attributable	**attributed**	attributes	attributing	attribution
188	***civil***					
189	***code***	coded	codes	coding		
190	*commit*	**commitment**	commitments	commits	committed	committing
191	*communicate*	communicable	communicated	communicates	communicating	**communication**
		communications	communicative	communicatively	uncommunicative	
192	*concentrate*	concentrated	concentrates	concentrating	**concentration**	
193	*confer*	**conference**	conferences	conferred	conferring	confers
194	***contrast***	contrasted	contrasting	contrastive	contrasts	
195	***cycle***	cycled	cycles	cyclic	cyclical	cycling
196	***debate***	debatable	debated	debates	debating	
197	***despite***					
198	*dimension*	dimensional	**dimensions**	multidimensional		
199	***domestic***	domestically	domesticate	domesticated	domesticating	domestics
200	*emerge*	**emerged**	emergence	emergent	emerges	emerging
201	***error***	erroneous	erroneously	errors		
202	***ethnic***	ethnicity				
203	*goal*	**goals**				
204	*grant*	**granted**	granting	grants		
205	***hence***					
206	***hypothesis***	hypotheses	hypothesize	hypothesized	hypothesizes	hypothesizing
		hypothetical	hypothetically			
207	*implement*	**implementation**	implemented	implementing	implements	
208	*implicate*	implicated	implicates	implicating	implication	**implications**
209	*impose*	**imposed**	imposes	imposing	imposition	
210	*integrate*	integrated	integrates	integrating	**integration**	
211	***internal***	internalize	internalized	internalizes	internalizing	internally
212	*investigate*	investigated	investigates	investigating	**investigation**	investigations
		investigative	investigator	investigators		
213	***job***	jobs				
214	***label***	labeled	labeling	labeled	labeling	labels
215	***mechanism***	mechanisms				
216	***obvious***	obviously				
217	*occupy*	occupancy	occupant	occupants	occupation	**occupational**
		occupations	occupied	occupier	occupiers	occupies
		occupying				
218	***option***	optional	options			
219	***output***	outputs				
220	***overall***					
221	***parallel***	paralleled	paralleling	parallels	unparalleled	
222	*parameter*	**parameters**				
223	***phase***	phased	phases	phasing		
224	*predict*	predictability	predictable	predictably	**predicted**	predicting
		prediction	predictions	predicts	unpredictability	unpredictable
225	***principal***	principally				
226	***prior***					
227	***professional***	professionally	professionals	professionalism		

228	***project***	projected	projecting	projection	projections	projects
229	***promote***	promoted	promoter	promoters	promotes	promoting
		promotion	promotions			
230	***regime***	regimes				
231	*resolve*	**resolution**	resolved	resolves	resolving	unresolved
232	*retain*	**retained**	retaining	retainer	retainers	retains
		retention	retentive			
233	***series***					
234	*statistic*	statistician	statisticians	statistical	statistically	**statistics**
235	***status***					
236	***stress***	stressed	stresses	stressful	stressing	unstressed
237	***subsequent***	subsequently				
238	***sum***	summation	summed	summing	sums	
239	***summary***	summaries	summarization	summarizations	summarize	summarized
		summarizes	summarizing			
240	*undertake*	**undertaken**	undertakes	undertaking	undertook	

Sublist 5

241	*academy*	academia	**academic**	academically	academics	academies
242	*adjust*	adjusted	adjusting	**adjustment**	adjustments	adjusts
		readjust	readjusted	readjusting	readjustment	readjustments
		readjusts				
243	***alter***	alterable	alteration	alterations	altered	altering
		alternate	alternating	alters	unalterable	unaltered
244	*amend*	amended	amending	**amendment**	amendments	amends
245	***aware***	awareness	unaware			
246	***capacity***	capacities	incapacitate	incapacitated		
247	***challenge***	challenged	challenger	challengers	challenges	challenging
248	***clause***	clauses				
249	*compound*	compounded	compounding	**compounds**		
250	***conflict***	conflicted	conflicting	conflicts		
251	*consult*	consultancy	consultant	consultants	**consultation**	consultations
		consultative	consulted	consults	consulting	
252	***contact***	contactable	contacted	contacting	contacts	
253	***decline***	declined	declines	declining		
254	*discrete*	discretely	**discretion**	discretionary	indiscrete	indiscretion
255	*draft*	drafted	drafting	drafts	redraft	redrafted
		redrafting	redrafts			
256	***enable***	enabled	enables	enabling		
257	***energy***	energetic	energetically	energies		
258	*enforce*	enforced	**enforcement**	enforces	enforcing	
259	*entity*	**entities**				
260	***equivalent***	equivalence				
261	*evolve*	**evolution**	evolved	evolving	evolves	evolutionary
		evolutionist	evolutionists			
262	*expand*	expanded	expanding	expands	**expansion**	expansionism
		expansive				
263	*expose*	exposed	exposes	exposing	**exposure**	exposures
264	***external***	externality	externalization	externalize	externalized	externalizes
		externalizing	externally			
265	***facilitate***	facilitated	facilitates	facilities	facilitating	facilitation

		facilitator	facilitators	facility		
266	***fundamental***	fundamentally				
267	*generate*	**generated**	generates	generating		
268	***generation***	generations				
269	***image***	imagery	images			
279	***liberal***	liberalism	liberalization	liberalize	liberalized	liberalizes
		liberalizing	liberally	liberals	liberate	liberated
		liberates	liberating	liberation	liberations	liberator
		liberators				
271	***license***	licenses	license	licensed	licensing	licenses
		unlicensed				
272	***logic***	illogical	illogically	logical	logically	logician
		logicians				
273	*margin*	**marginal**	marginally	margins		
274	***medical***	medically				
275	***mental***	mentality	mentally			
276	*modify*	modification	modifications	**modified**	modifies	modifying
		unmodified				
277	*monitor*	monitored	**monitoring**	monitors	unmonitored	
278	***network***	networked	networking	networks		
279	***notion***	notions				
280	***objective***	objectively	objectivity			
281	*orient*	orientate	orientated	orientates	**orientation**	orientating
		oriented	orienting	orients	reorient	reorientation
282	***perspective***	perspectives				
283	***precise***	imprecise	precisely	precision		
284	***prime***	primacy				
285	***psychology***	psychological	psychologically	psychologist	psychologists	
286	***pursue***	pursued	pursues	pursuing	pursuit	pursuits
287	***ratio***	ratios				
288	*reject*	**rejected**	rejecting	rejection	rejects	rejections
289	***revenue***	revenues				
290	*stable*	instability	**stability**	stabilization	stabilize	stabilized
		stabilizes	stabilizing	unstable		
291	*style*	styled	**styles**	styling	stylish	stylize
		stylized	stylizes	stylizing		
292	*substitute*	substituted	substitutes	substituting	**substitution**	
293	*sustain*	**sustainable**	sustainability	sustained	sustaining	sustains
		sustenance	unsustainable			
294	*symbol*	**symbolic**	symbolically	symbolism	symbolize	symbolized
		symbolizes	symbolizing	symbols		
295	***target***	targeted	targeting	targets		
296	*transit*	transited	transiting	**transition**	transitional	transitions
		transitory	transits			
297	***trend***	trends				
298	***version***	versions				
299	***welfare***					
300	***whereas***					

Sublist 6

301	***abstract***	abstraction	abstractions	abstractly	abstracts	

302	***accurate***	accuracy	accurately	inaccuracy	inaccuracies	inaccurate
303	*acknowledge*	**acknowledged**	acknowledges	acknowledging	acknowledgement	acknowledgements
304	***aggregate***	aggregated	aggregates	aggregating	aggregation	
305	*allocate*	allocated	allocates	allocating	**allocation**	allocations
306	*assign*	**assigned**	assigning	assignment	assignments	assigns
		reassign	reassigned	reassigning	reassigns	unassigned
307	*attach*	**attached**	attaches	attaching	attachment	attachments
		unattached				
308	***author***	authored	authoring	authors	authorship	
309	***bond***	bonded	bonding	bonds		
310	***brief***	brevity	briefed	briefing	briefly	briefs
311	***capable***	capabilities	capability	incapable		
312	*cite*	citation	citations	**cited**	citing	cites
313	*cooperate*	cooperated	cooperates	cooperating	cooperation	**cooperative**
		cooperatively				
314	*discriminate*	discriminated	discriminates	discriminating	**discrimination**	
315	***display***	displayed	displaying	displays		
316	*diverse*	diversely	diversification	diversified	diversifies	diversify
		diversifying	**diversity**			
317	***domain***	domains				
318	*edit*	edited	editing	**edition**	editions	editor
		editorial	editorials	editors	edits	
319	*enhance*	**enhanced**	enhancement	enhances	enhancing	
320	***estate***	estates				
321	***exceed***	exceeded	exceeding	exceeds		
322	***expert***	expertise	expertly	experts		
323	***explicit***	explicitly				
324	***federal***	federation	federations			
325	*fee*	**fees**				
326	*flexible*	**flexibility**	inflexible	inflexibility		
327	***furthermore***					
328	***gender***	genders				
329	*ignorant*	ignorance	ignore	**ignored**	ignores	ignoring
330	***incentive***	incentives				
331	***incidence***	incident	incidentally	incidents		
332	*incorporate*	**incorporated**	incorporates	incorporating	incorporation	
333	***index***	indexed	indexes	indexing		
334	*inhibit*	inhibited	inhibiting	**inhibition**	inhibitions	inhibits
335	*initiate*	initiated	initiates	initiating	initiation	initiations
		initiative	**initiatives**	initiator	initiators	
336	***input***	inputs				
337	*instruct*	instruction	instructed	instructing	**instructions**	instructive
		instructor	instructors	instructs		
338	*intelligent*	**intelligence**	intelligently	unintelligent		
339	***interval***	intervals				
340	***lecture***	lectured	lecturer	lecturers	lectures	lecturing
341	*migrate*	migrant	migrants	migrated	migrates	migrating
		migration	migrations	migratory		
342	***minimum***					
343	***ministry***	ministered	ministering	ministerial	ministries	
344	*motive*	motivate	motivated	motivates	motivating	**motivation**

		motivations	motives	unmotivated		
345	***neutral***	neutrality	neutralization	neutralize	neutralized	neutralizes
		neutralizing				
346	***nevertheless***					
347	***overseas***					
348	*precede*	preceded	precedence	precedent	precedes	**preceding**
		unprecedented				
349	*presume*	presumably	presumed	presumes	presuming	**presumption**
		presumptions	presumptuous			
350	***rational***	irrational	rationalism	rationality	rationalization	rationalizations
		rationalize	rationalized	rationalizes	rationalizing	rationally
351	*recover*	recoverable	recovered	recovering	recovers	**recovery**
352	*reveal*	**revealed**	revealing	reveals	revelation	revelations
353	***scope***					
354	*subsidy*	**subsidiary**	subsidies	subsidize	subsidized	subsidizes
		subsidizing				
355	*tape*	taped	**tapes**	taping		
356	***trace***	traceable	traced	traces	tracing	
357	*transform*	**transformation**	transformations	transformed	transforming	transforms
358	***transport***	transportation	transported	transporter	transporters	transporting
		transports				
359	*underlie*	underlay	underlies	**underlying**		
360	*utilize*	utilities	**utility**	utilization	utilize	utilized
		utilizes	utilizing			

Sublist 7

361	*adapt*	adaptability	adaptable	**adaptation**	adaptations	adapted
		adapting	adaptive	adapts		
362	*adult*	adulthood	**adults**			
363	***advocate***	advocacy	advocated	advocates	advocating	
364	***aid***	aided	aiding	aids	unaided	
365	***channel***	channeled	channeling	channels		
366	***chemical***	chemically	chemicals			
367	*classic*	**classical**	classics			
368	***comprehensive***	comprehensively				
369	***comprise***	comprised	comprises	comprising		
370	*confirm*	confirmation	**confirmed**	confirming	confirms	
371	***contrary***	contrarily				
372	*convert*	conversion	conversions	**converted**	convertible	converting
		converts				
373	***couple***	coupled	coupling	couples		
374	*decade*	**decades**				
375	***definite***	definitely	definitive	indefinite	indefinitely	
376	***deny***	deniable	denial	denials	denied	denies
		denying	undeniable			
377	*differentiate*	differentiated	differentiates	differentiating	**differentiation**	
378	*dispose*	disposable	**disposal**	disposed	disposes	disposing
379	***dynamic***	dynamically	dynamics			
380	***eliminate***	eliminated	eliminates	eliminating	elimination	
381	***empirical***	empirically	empiricism			
382	*equip*	**equipment**	equipped	equipping	equips	

383	***extract***	extracted	extracting	extraction	extracts	
384	***file***	filed	files	filing		
385	***finite***	infinite	infinitely			
386	***foundation***	foundations				
387	*globe*	**global**	globally	globalization	globalization	
388	***grade***	graded	grades	grading		
389	***guarantee***	guaranteed	guaranteeing			
390	*hierarchy*	**hierarchical**	hierarchies			
391	***identical***	identically				
392	***ideology***	ideological	ideologically	ideologies		
393	*infer*	inference	inferences	**inferred**	inferring	infers
394	*innovate*	**innovation** innovative	innovated innovator	innovates innovators	innovating	innovations
395	***insert***	inserted	inserting	insertion	inserts	
396	*intervene*	intervened	intervenes	intervening	**intervention**	interventions
397	*isolate*	**isolated**	isolates	isolating	isolation	isolationism
398	***media***					
399	***mode***	modes				
400	***paradigm***	paradigms				
401	***phenomenon***	phenomena	phenomenal			
402	***priority***	priorities prioritizing	prioritization	prioritize	prioritized	prioritizes
403	*prohibit*	**prohibited** prohibits	prohibiting	prohibition	prohibitions	prohibitive
404	***publication***	publications				
405	*quote*	**quotation**	quotations	quoted	quotes	quoting
406	***release***	released	releases	releasing		
407	***reverse***	reversal reversals	reversed irreversible	reverses	reversible	reversing
408	*simulate*	simulated	simulates	simulating	**simulation**	
409	*sole*	**solely**				
410	***somewhat***					
411	*submit*	submission	submissions	submits	**submitted**	submitting
412	*successor*	succession	successions	**successive**	successively	successors
413	***survive***	survival survivors	survived	survives	surviving	survivor
414	***thesis***	theses				
415	***topic***	topical	topics			
416	*transmit*	**transmission**	transmissions	transmitted	transmitting	transmits
417	*ultimate*	**ultimately**				
418	***unique***	uniquely	uniqueness			
419	***visible***	visibility	visibly	invisible	invisibility	
420	***voluntary***	voluntarily	volunteer	volunteering	volunteered	volunteers

Sublist 8

421	***abandon***	abandoned	abandoning	abandonment	abandons	
422	*accompany*	**accompanied**	accompanies	accompaniment	accompanying	unaccompanied
423	*accumulate*	accumulated	accumulating	**accumulation**	accumulates	
424	***ambiguous***	ambiguities	ambiguity	unambiguous	unambiguously	
425	*append*	**appendix** appendixes	appended	appends	appending	appendices

426	*appreciate*	appreciable	appreciably	appreciated	appreciates	appreciating
		appreciation	unappreciated			
427	***arbitrary***	arbitrariness	arbitrarily			
428	*automate*	automatic	automated	automates	automating	**automatically**
		automation				
429	***bias***	biased	biases	biasing	unbiased	
430	***chart***	charted	charting	charts	uncharted	
431	*clarify*	clarification	clarified	clarifies	clarifying	**clarity**
432	***commodity***	commodities				
433	***complement***	complementary	complemented	complementing	complements	
434	*conform*	conformability	conformable	conformance	conformation	conformed
		conforming	conformist	conformists	**conformity**	conforms
		nonconformist	nonconformists	nonconformity		
435	***contemporary***	contemporaries				
436	*contradict*	contradicted	contradicting	**contradiction**	contradictions	contradictory
		contradicts				
437	***crucial***	crucially				
438	***currency***	currencies				
439	***denote***	denotation	denotations	denoted	denotes	denoting
440	*detect*	detectable	**detected**	detecting	detection	detective
		detectives	detector	detectors	detects	
441	*deviate*	deviated	deviates	deviating	**deviation**	deviations
442	*displace*	displaced	**displacement**	displaces	displacing	
443	*drama*	dramas	**dramatic**	dramatically	dramatist	dramatists
		dramatization	dramatizations	dramatize	dramatized	dramatizes
		dramatizing				
444	*eventual*	eventuality	**eventually**			
445	***exhibit***	exhibited	exhibiting	exhibition	exhibitions	exhibits
446	*exploit*	**exploitation**	exploited	exploiting	exploits	
447	*fluctuate*	fluctuated	fluctuates	fluctuating	fluctuation	**fluctuations**
448	*guideline*	**guidelines**				
449	*highlight*	**highlighted**	highlighting	highlights		
450	***implicit***	implicitly				
451	*induce*	**induced**	induces	inducing	induction	
452	*inevitable*	inevitability	**inevitably**			
453	***infrastructure***	infrastructures				
454	*inspect*	inspected	inspecting	**inspection**	inspections	inspector
		inspectors	inspects			
455	*intense*	intensely	intenseness	intensification	intensified	intensifies
		intensify	intensifying	intension	**intensity**	intensive
		intensively				
456	*manipulate*	manipulated	manipulates	manipulating	**manipulation**	manipulations
		manipulative				
457	*minimize*	**minimized**	minimizes	minimizing		
458	***nuclear***					
459	***offset***	offsets	offsetting			
460	***paragraph***	paragraphing	paragraphs			
461	***plus***	pluses				
462	*practitioner*	**practitioners**				
463	*predominant*	predominance	**predominantly**	predominate	predominated	predominates
		predominating				

464	***prospect***	prospective	prospects			
465	***radical***	radically	radicals			
466	***random***	randomly	randomness			
467	*reinforce*	**reinforced**	reinforcement	reinforcements	reinforces	reinforcing
468	***restore***	restoration	restored	restores	restoring	
469	*revise*	revised	revises	revising	**revision**	revisions
470	***schedule***	reschedule schedules	rescheduled scheduling	reschedules unscheduled	rescheduling	scheduled
471	*tense*	**tension**	tensely	tenser	tensest	tensions
472	*terminate*	terminal **termination**	terminals terminations	terminated	terminates	terminating
473	***theme***	themes	thematic	thematically		
474	***thereby***					
475	***uniform***	uniformity	uniformly			
476	***vehicle***	vehicles				
477	***via***					
478	*virtual*	**virtually**				
479	***visual***	visualization	visualize	visualized	visualizing	visually
480	***widespread***					

Sublist 9

481	*accommodate*	accommodated	accommodates	accommodating	**accommodation**	
482	*analogy*	analogies	**analogous**			
483	*anticipate*	**anticipated**	anticipates	anticipating	anticipation	unanticipated
484	*assure*	**assurance** assuring	assurances	assured	assuredly	assures
485	*attain*	attainable attains	**attained** unattainable	attaining	attainment	attainments
486	***behalf***					
487	***bulk***	bulky				
488	*cease*	ceased	ceaseless	**ceases**	ceasing	
489	*coherent*	**coherence**	coherently	incoherent	incoherently	
490	***coincide***	coincided coincident	coincides coincidental	coinciding	coincidence	coincidences
491	*commence*	**commenced** recommenced	commences recommencing	commencement	commencing	recommences
492	*compatible*	compatibility	incompatibility	**incompatible**		
493	***concurrent***	concurrently				
494	*confine*	**confined**	confines	confining	unconfined	
495	***controversy***	controversies	controversial	controversially	uncontroversial	
496	*converse*	**conversely**				
497	***device***	devices				
498	*devote*	**devoted** devotions	devotedly	devotes	devoting	devotion
499	*diminish*	**diminished**	diminishes	diminishing	diminution	undiminished
500	*distort*	**distorted**	distorting	distortion	distortions	distorts
501	***duration***					
502	*erode*	eroded	erodes	eroding	**erosion**	
503	*ethic*	**ethical**	ethically	ethics	unethical	
504	***format***	formatted	formatting	formats		
505	*found*	**founded**	founder	founders	founding	unfounded

506	***inherent***	inherently				
507	*insight*	insightful	**insights**			
508	***integral***					
509	***intermediate***					
510	***manual***	manually	manuals			
511	***mature***	immature	immaturity	maturation	maturational	matured
		matures	maturing	maturity		
512	*mediate*	mediated	mediates	mediating	**mediation**	
513	***medium***					
514	***military***					
515	***minimal***	minimalist	minimalistic	minimalists	minimally	
516	***mutual***	mutually				
517	*norm*	**norms**				
518	***overlap***	overlapped	overlapping	overlaps		
519	***passive***	passively	passivity			
520	***portion***	portions				
521	***preliminary***	preliminaries				
522	***protocol***	protocols				
523	***qualitative***	qualitatively				
524	***refine***	refined	refinement	refinements	refines	refining
525	*relax*	relaxation	**relaxed**	relaxes	relaxing	
526	*restrain*	restrained	restraining	restrains	restraint	**restraints**
		unrestrained				
527	***revolution***	revolutionaries	revolutionary	revolutionist	revolutionists	revolutionize
		revolutionized	revolutionizing	revolutions		
528	***rigid***	rigidities	rigidity	rigidly		
529	***route***	routed	routes	routing		
530	***scenario***	scenarios				
531	***sphere***	spheres	spherical	spherically		
532	***subordinate***	subordinates	subordination			
533	*supplement*	**supplementary**	supplemented	supplementing	supplements	
534	*suspend*	**suspended**	suspending	suspends	suspension	
535	***team***	teamed	teaming	teams		
536	***temporary***	temporarily				
537	***trigger***	triggered	triggering	triggers		
538	*unify*	unification	**unified**	unifies	unifying	
539	*violate*	violated	violates	violating	**violation**	violations
540	***vision***	visions				

Sublist 10

541	***adjacent***					
542	***albeit***					
543	*assemble*	assembled	assembles	assemblies	assembling	**assembly**
544	***collapse***	collapsed	collapses	collapsible	collapsing	
545	*colleague*	**colleagues**				
546	*compile*	compilation	compilations	**compiled**	compiles	compiling
547	*conceive*	conceivable	conceivably	**conceived**	conceives	conceiving
		inconceivable	inconceivably			
548	*convince*	**convinced**	convinces	convincing	convincingly	unconvinced
549	*depress*	depressed	depresses	depressing	**depression**	
550	*encounter*	**encountered**	encountering	encounters		

551	***enormous***	enormity	enormously			
552	***forthcoming***					
553	*incline*	**inclination**	inclinations	inclined	inclines	inclining
554	***integrity***					
555	***intrinsic***	intrinsically				
556	*invoke*	**invoked**	invokes	invoking		
557	***levy***	levies				
558	***likewise***					
559	***nonetheless***					
560	***notwithstanding***					
561	***odd***	odds				
562	***ongoing***					
563	***panel***	paneled	paneling	panels		
564	*persist*	persisted persists	persistence	**persistent**	persistently	persisting
565	*pose*	**posed**	poses	posing		
566	*reluctance*	**reluctant**	reluctantly			
567	**so-*called***					
568	***straightforward***					
569	***undergo***	undergoes	undergoing	undergone	underwent	
570	***whereby***					

8.3 Logical Connectors

(The words in **bold** are also on the Academic Word List).

		Coordinating and Correlating Conjunctions	Subordinating Conjunctions
1	**Addition**	and, and also, nor, not only … but also, neither … nor, both … and	besides, in addition to, not to mention
2	**Alternative**	and, or, either … or …	
3	**Cause**		as, as long as, because, due to the fact that, for, in that, in view of the fact that, inasmuch as, now that, since
4	**Clarification**	(comma), (dash), (parentheses), (semicolon),	
5	**Comparison**		as, as … as, the same … as
6	**Condition**	either … or …, or, or else	as long as, even if, if, if … then …, in case, provided that, unless, whether, whether or not
7	**Contrast**	but, or, yet	…er / more / less … than, **albeit**, although, **despite** the fact that, even though, in spite of the fact that, regardless of, though, **whereas**, while
8	**Effect**	and as a result, so, or, or else	
9	**Emphasis**		
10	**Example**	(colon), (dash)	
11	**Purpose**		in order that, in order to, so that, such that
12	**Sequence**	(see time)	(see time)
13	**Summary**		
14	**Time**	and, and then	after, as, as long as, as soon as, at the time, before, by the time (that), during, every time (that), now that, once, **prior** to, since, so long as, until, up to the time (that), when, whenever, while

8.3 Logical Connectors

(The words in **bold** are also on the Academic Word List).

		Sentence Conjunctions	Prepositions
1	**Addition**	above all, actually, also, as a matter of fact, as well, besides, certainly, **furthermore**, in addition, in fact, moreover, what is more	along with, besides, in addition to
2	**Alternative**	alternatively	
3	**Cause**		as a result of, because of, due to, for, in view of, on account of
4	**Clarification**	I mean, in other words, that is, i.e.,	
5	**Comparison**	in the same way, **likewise**, similarly	like
6	**Condition**	otherwise	in case of, regardless of
7	**Contrast**	admittedly, after all, alteratively, **conversely**, even so, however, **in contrast**, in spite of this, instead, **nevertheless**, **nonethelesss**, **notwithstanding**, on the **contrary**, on the other hand, regardless, still, though	**contrary to**, **despite**, different from, different to, **in contrast to**, in spite of, instead of, regardless of, unlike
8	**Effect**	accordingly, as a result, **consequently**, **hence**, therefore, thus	
9	**Emphasis**	above all, certainly, in fact, indeed, more than anything else, most of all, of course,	
10	**Example**	as an example, e.g., especially, for example, for instance, in particular, the point is, to illustrate	like, such as
11	**Purpose**	for this purpose, with this in mind	as, for
12	**Sequence**	finally, first, first of all, in the first place, in the second place, in turn, lastly, next, secondly, then, to begin with, to start with	(see time)
13	**Summary**	all in all, as has been mentioned, as has been said, briefly, in short, in **conclusion, in summary**, **overall**, to **conclude**, to summarize	
14	**Time**	at first, after that, at last, at present, **eventually**, finally, first, first of all, in the end, in the first place, in the second place, in turn, **initially**, last, lastly, later, meanwhile, next, now, once, originally, secondly, since then, soon, so far, **subsequently**, then, to begin with, to conclude, to start with, **ultimately**	after, as of, before, by, during, for, from, **prior** to, since, until, up to, within

8.4 Signal Words

Here is a list of signal words that will help you to identify the pattern of text organization: (Words in bold are Academic Word List words).

1) *Definition*

is called	is characterized by	is concerned with	concerns
is **defined** as	**denotes**	describes	**indicates**
involves	is	is known as	means
refers to	stands for	term	

2) *Classification or Enumeration*

1 (one)	2 (two)	3 (three)	also
another	**categories**	**categorize**	classes
consists of	**constitutes**	**distinct**	divided into
element(s)	**factor(s)**	finally	first
includes	kind(s)	lastly	many
most	number	other(s)	second
several	some	third	type(s)

3) *Comparison*

alike	also	as ... as	both
common	comparable	equally	**equivalent**
identical	in the same way	like	**likewise**
parallel	resembles	same	**similar**
similarities	**similarity**	**similarly**	

Contrast

...er	admittedly	after all	**albeit**
alternatively	although	but	**contradict**
contrary	**contrast**	**conversely**	**despite**
difference	different	**differentiate**	differs from
discriminate	**distinction**	distinguish	even so
even though	however	in spite of	instead
less	more	**nevertheless**	**nonetheless**
notwithstanding	on the other hand	opposed to	rather than
regardless	still	though	unlike
whereas	while	yet	

8.4 Signal Words

Here is a list of signal words that will help you to identify the pattern of text organization: (Words in bold are Academic Word List words).

4) *Time Order or Sequence*

after	at *time*	before	begin
by	**conclude**	during	(in the) end
eventually	final(ly)	first	for
from	in *month*, *year*	in turn	**initially**
last(ly)	later	meanwhile	next
now	on *date*	once	originally
period	**prior** (to)	process	second
sequence	since	so far	(as) soon (as)
stage(s)	start	step(s)	**subsequently**
then	till	time	**ultimately**
up to	when	whenever	

5) *Cause*

(on) account (of)	as	because	by
cause	is caused by	**consequence**	due to
in that	in view of	inasmuch as	now that
reason(s)	results from	since	works by

Effect

effect	gives rise to	(the) result	results in
so (that)	**thereby**	therefore	thus

8.5 Prefixes and Roots

Words in bold are the most common words of each of the 570 families of the Academic Word List. Words in italic are less common words of the 570 word families of the Academic Word List. Words that are neither in bold, nor in italic, are part of the General Service Word List. Words that are in parentheses are words that are neither on the GSL nor the AWL.

Prefix or Root	Meaning	Example
a, an	not, without	(abiotic), (anaerobic), *asexual*, (atheist)
ab, abs	away from	*abnormal*, **abstract**, *abstraction*, absence, absent
act, agi	do, act, drive	action, active, actor, actress, actual, (agile), (agitate), *interact*, **interaction**, *react*, **reaction**
alter	change, other	**alter**, **alternative**
am, amor	love, like	(amorous), (amiable), (amicable)
ambul	walk	(amble), (ambulance)
amphi	both or all sides	(amphibian)
anim	life, mind, soul	animal, (animate), (animation), (animosity)
ann, annu, enni	yearly	(anniversary), **annual**, (biannual), (perennial)
ante, ant	before, front	(anterior), *anticipate*, **anticipated**, (antipasto), (antique)
anthrop	human	(anthropology), (anthropologist)
anti, ant	against, opposite	(antibody), (antisocial), (antifreeze)
aqua, aque	water	(aquamarine), (aquarium), (aquatic), (aqueduct)
arch	chief, leader, ruler	arch, (archenemy), *hierarchy*, **hierarchica**l, (matriarch), (patriarch)
arthro	joint	(arthritis), (arthropod)
auc, aug	increase	(auction), (augment)
aud, audi, aur	hear	audience, (audible), (audiovisual), (audition)
author	master, originate	**author**, **authority,** *authoritative*, *authorize*
auto, aut	self, same, from within	(autism), (autobiography), (automobile), *automatic*, **automatically**
bene	good, well	*beneficial*, (benevolent), **benefit**
bi, bin	two	bicycle, (bilingual), (binary), (bivalve)
biblio	book	(bibliography)
bio, bi	life	(autobiography), (biography), (biology), (biosphere)
brev	short	(abbreviate), **brief**, *brevity*
cap	take, hold, seize	**capable**, **capacity**, (captivate), (capture)
cat, cata	down	(catalogue), *category*, **categories, (catastrophe)**
cede, ceed, cess, cease	go, yield	**access**, excess, **preceding**, **procedure**, **process**, (recess), (recessive), success, **successive**
cent	hundred	cent, (centimeter), century, **percent**, *percentage*
centr	center	*concentrate*, **concentration**, (centrifuge), (egocentric), (ethnocentric)
chrom	color	(chromosome), (monochrome), (polychrome)
chron	time	(chronic), (chronicle), (chronology)
cid	kill	(homicide), (suicide), (genocide)
circum, circu	around	(circuit), (circulation), (circumference), *circumstance*, **circumstances**
claim, clam	shout	(acclaim), claim, (clamor), (exclaim), (proclaim)
clin	lean, bend	**decline**, *incline*, **inclination**
clud, claus, clos, clus	close, shut	**clause**, *conclude*, **conclusion**, **excluded**, enclose, enclosure, *exclusive*, include, inclusive
cogn, gnos	know, learn	(diagnose), **ignored**, *ignorant*, *ignorance*, recognize

co, cog, col, com, con cor	together, with	**coherence**, *coherent*, **coincide**, *coincidence*, *colleague*, **colleagues**, collect, combine, *commit*, **commitment**, **community**, *communicate*, **communication**, *compatible*, *compile*, **compiled**, *component*, **components**, *conceive*, **conceived**, *concentrate*, **concentration**, **constant**, **contract**, *cooperate*, **cooperative**, **incompatible**
contra, counter	against, opposite	*contradict*, **contradiction**, **contrary**, **contrast**, **controversy**, *encounter*, **encountered**
corp	body	**corporate**, *corporation*, *incorporate*, **incorporated**
cour, cur, curr, curs	run	course, current, **concurrent**, **currency**, (curriculum)
crac, crat	rule, ruler	(bureaucrat), (democracy)
cresc, cret, crease	grow	**create**, (concrete), creature, (crescent), decrease, increase
cred	believe	(credible), **credit**, (incredible)
cruc	cross	**crucial**
crusta	shell	(crustacean)
crypt	hidden	(crypt), (cryptic)
culp	blame	(culpable), (culprit)
cycl	circle, wheel	bicycle, **cycle**, *recycle*
de	from, away from, down, off	**decline**, decrease, descend, descendant, descent, destruct, destruction, **deny**, *depress*, **depression**, *deregister*, *deregulate*, *derive*, **derived**, *deviate*, **deviation**
dec	ten	(decimal), *decade*, **decades**
dei, div	God	(divine), (divinity), (deity)
demo	people	(democracy), (endemic), (epidemic), (pandemic)
dent	tooth	(dentist), (dental)
derm	skin	(dermatology), (epidermis)
di	two	divide, division, (dilemma), (dioxide)
dia	across, between, through	(diagnosis), (diagonal), (dialogue), (diameter)
dic, dict, dit	say, speak	*contradict*, **contradiction**, dictionary, (dictation), **indicate**, *predict*, **predicted**, (verdict)
dis, di, dif, dys	apart, away, from	difference, different, *differentiate*, **differentiation**, *diminish*, **diminished**, disagree, disappear, disappoint, disapprove, discipline, discomfort, discontent, *discrete*, **discretion**, *discriminate*, **discrimination**, discuss, *disestablish*, dismiss, *displace*, **displacement**, **display**, *dispose*, **disposal**, *disproportionate*, disregard, disrespect, dissatisfy, *dissimilar*, distance, distant, *distinct*, **distinction**, distinguish, *distort*, **distortion**, *distribute*, **distribution**, district, disturb
doc, doct	teach, prove	doctor, **document**
dog, dox	belief, opinion	(dogma), (orthodox), (paradox)
du, duo	two	(duel), (duet), (duo)
duc, duct	lead, bring, draw out	**conduct**, *deduce*, **deduction**, *induce*, **induced**, introduce, introduction, produce, reduce, reproduction
dynam	power	(aerodynamics), **dynamic**, (dynamite)
ecto	outside, external	(ectoplasm)
ego	self	(egocentric), (egoism), (egotistical)
en, em	in, at, cause, cover, make, provide	**emphasis**, **enable**, **energy**, *enforce*, **enforcement**, **ensure**

endo	inside, within	(endoscope)
epi	at, over, upon, in addition	(epicenter), (epidemic), (epilogue)
eu	good, well, true	(eukaryote), (euphoria), (euthanasia),
equ	equal	**adequate**, equal, *equate*, **equation**, **equivalent**
ex, exo, extra	beyond, outside, outward	**exceed**, *exclude*, **excluded**, **exhibit**, *expand*, **expansion**, **explicit**, *exploit*, **exploitation**, **export**, *expose*, **exposure**, extend, extension, extensive, **external**, **extract**, extra, extreme, extraordinary
fac	make, do	**facilitate**, *factor*, **factors**, factory, manufacture
fer	bear, bring, carry	*confer*, **conference**, difference, different, *differentiate*, **differentiation**, *infer*, **inferred**, interfere, interference, offer, prefer, preference, refer, reference, suffer, **transfer**
fid	belief, faith	confidence, confident, confidential, (fidelity)
fil	thread, string	(filament), **file**, (profile)
flect, flex	bend	*flexible*, **flexibility**, reflect, reflection, (reflex)
flict	strike	(affliction), **conflict**, (inflict)
flu, fluct, flux	flow	*fluctuate*, **fluctuations**, (fluid), influence, influential, (influx), (reflux)
form	shape, appearance	*conform*, **conformity**, formal, **format**, **formula**, inform, (information), perform, performance, *transform*, **transformation**, **uniform**
fort, forc	power, strength	comfort, discomfort, *enforce*, **enforcement**, effort, force, *reinforce*, **reinforced**
fract, frag	break	(fraction), (fracture), (fragment)
frater	brother	(fraternal), (fraternity)
fuge	flee	(centrifuge), (fugitive), (refugee)
gam	marriage	(bigamy), (gamete), (monogamy), (polygamy)
gastro	stomach	(gastroenteritis), (gastronomy), (gastropod)
gen, gin	give birth, origin	**gender**, *generate*, **generated**, **generation**, (gene), (genetics)
geo	earth	(geography), (geology)
giga	billion (10^9), large	(gigabyte), (gigantic)
graph, gram, graf	write, draw	**paragraph**, grammar, gramatical, photograph, photography, program, telegraph
gym	naked	(gymnasium), (gymnosperm)
hemo, hema, hem	blood	(hemoglobin), (hemophilia)
hetero	other	(heterogeneous), (heterophyte)
hex, sex	six	(hexagon), (hexadecimal), (sextuplets)
holo	whole, entire	(holocaust), (hologram)
homo	human	human, (Homo sapiens)
homo, homeo	same, similar	(homogenous), (homosexual), (homozygous)
hydro, hydr	water	(dehydrate), (hydraulics), (hydroelectric), (hydrogen)
hyper	above, over, high	(hyperactive), (hypersensitive), (hypertension)
hypo	below, low, under	(hypocrite), (hypothermia), **hypothesis**
in, im	into, toward, within	*immigrate*, **immigration**, *incorporate*, **incorporated**, *inhibit*, **inhibition**, **input**, **insert**, *insight*, **insights**, **internal**, **intrinsic**

in, im, ig, il, ir	not	*ignore*, **ignored**, *ignorant*, *illegal*, *illogical*, *immature*, impossible, *imprecise*, *incapacitate*, *incoherent*, **incompatible**, *inconceivable*, *inconclusive*, *inconstantly*, *indiscrete*, infinite, *instability*, *invalidate*, *invariable*, *invisible*, *irrational*, *irrelevant*, *irreversible*
infra	below	(infrared), **infrastructure**
inter	between, among	*interact*, **interaction**, interfere, **intermediate**, (Internet), *interpret*, **interpretation**, interrupt, **interval**, *intervene*, **intervention**
intro	into, within	introduce, (introspection), (introvert)
iso	equal, identical	(isomer), (isosceles), (isotherm)
jac, ject	throw	(eject), (inject), object, **objective**, **project**, *reject*, **rejected**, subject
jud	judge	judge, prejudice
jug, junct, just	join	*adjust*, **adjustment**, (conjugation), (conjunction), (junction)
kilo	thousand (10^3)	(kilobyte), (kilogram), (kilometer)
lect, leg, lig	choose, gather, read, select	collect, elect, **lecture**, **neglect**, reflect, **select**
lex, leag, leg	law	college, **legal**, **legislation**
liter	letter	literacy, literature
loc	place, area	*allocate*, **allocation**, local, *locate*, **location**
log	say, speech, word, reason, study	**analogous**, apology, **logic**
luc	light	(elucidate), (lucid)
magn	large	(magnate), (magnificent), (magnify)
mal	bad, badly	(dismal), (malfunction)
man, manu	hand, make, do	manage, *manipulate*, **manipulation**, **manual**, manufacture
mar	sea	(marine), (mariner)
mater	mother	(maternal), (maternity)
mega	million (10^6), great	(megabyte), (megaphone)
mem	recall, remember	memory, (commemorate), remember
ment	mind	**mental**, (dementia)
mer	part, segment	(isomer), (monomer), (polymer)
meta	beyond, change	(metabolism), (metamorphosis), (metaphor)
metri, meter	measure	(metric), *parameter*, **parameters**, (thermometer)
micro	millionth (10^{-6}), small	(microgram), (microscope)
mill	thousand	(millennium)
milli	thousandth	(milligram), (millisecond), (millivolt)
min	small	*diminish*, **diminished**, **minimal**, *minimize*, **minimized**, **minimum**, *minor*, *minority*, **minorities**, (minuscule), minute
mis	bad, wrong	(misconduct), miserable, misery, miss, mistake
mit, miss	cause, go, send	admit, admission, **commission**, *commit*, committee, **commitment**, dismiss, omission, omit, permission, permit, promise, *submit*, **submitted**, *transmit*, **transmission**
mob, mot, mov	move	(mobile), *motive*, *motivate*, **motivation**, motion, motor, move, **promote**, *remove*, **removed**
mono	one	(monologue), (monopoly), (monorail)
mor, mort	death	(immortality), (mortal), (mortician)
morph	form, structure	(amorphous), (metamorphosis), (morphology)

multi	many	(multicellular), *multi-dimensional*, multiply, multiplication
mut	change	(mutant), (mutation)
nano	billionth (10^{-9})	(nanosecond), (nanoparticles), (nanotechnology)
nasc, nat, gnant	birth	(denature), (nascent), nation, native, nature, (pregnant)
neuro	nerve	(neurology), (neuroscience)
nom, nym	name, word	(anonymous), (nominate), (pseudonym), (synonym)
non	nine	(nonagon)
non	not	(nonalcoholic), *nonconformist*, (nonessential), (non-governmental organization), (nonlinear), (nonmetallic), (nonsmoker), *nontraditional*
nov	new	*innovate*, **innovation**, (novel), (novice)
oct	eight	(octopus), (octagon), (octave)
omni	all	(omnibus), (omnivore)
oper	work	*cooperate*, **cooperative**, *cooperation*, operate, operation, operator
ortho	straight, correct	(orthodox), (orthodontist), (orthopedic)
over	excessive, above	**overall**, *overestimate*, overcome, overflow, **overlap**, **overseas**
pac	peace	(Pacific Ocean), (pacifist), (pacify)
para	beside	**paradigm**, **paragraph**, **parallel**, *parameter*, **parameters**
pat, pass, path	feel, suffer	(apathy), *compatible*, (empathy), **incompatible**, **passive**, patience, patient, (psychopath), sympathetic, sympathy
pater	father	(paternal), (paternity), (patriotic)
ped, pod	foot	(pedal), (gastropod), (podium)
pel, puls	drive, push	(pulse), (repel)
pend	hang, weigh	*append*, **appendix**, *suspend*, **suspended**, (pendant), (pending)
penta, quint	five	(pentagon), (quintet)
per	through, across, by	**percent**, *perceive*, **perceived**, perfect, permission, *persist*, **persistent**, **perspective**, persuade
peri	around	**period**, *periodic*, (perimeter)
phan, phas, phen, fan	show, make visible	**emphasis**, fancy, (phantom), **phenomenon**
phil	love	*philosopher*, **philosophy**
phon	sound	(microphone), (phonics), telephone
phot	light	photograph, (photon), (photosynthesis)
pict	paint, show, draw	(depict), picture
plan	flat	(planar), (plane)
pli, plex, ply	fold, bend	application, apply, complicate, complication, **complex**, **explicit**, *implicate*, **implications**, **implicit**, **implies**, *imply*, multiplication, multiply, reply
pneum	lung	(pneumatic), (pneumonia)
pod	foot	(gastropod), (podium)
poly	many	(polyethylene), (polygon), (polymer)
pon, pos	put, place, set	*component*, **components**, compose, composition, (decompose), (depose), (deposit), *dispose*, **disposal**, *expose*, **exposure**, *impose*, **imposed**, oppose, opposite, opposition, *pose*, **posed**, **positive**, position, post, (poster), postpone, propose, suppose
port	carry	**export**, (import), importance, important, (porter), report, (reporter), **transport**, support

post	after, behind	(postgraduate), (postmortem), postpone, (postscript)
pot, poss	power, ability	impossible, possess, possession, possessor, possible, (potent), **potential**
pre	before, first	*precede*, **preceding**, *predict*, **predicted**, *predominant*, **predominantly**, prefer, preference, **preliminary**, prepare, (prescribe), (prescription), present, (presentation), preserve, president, *presume*, **presumption**, pretend, prevent, prevention, (preview), **previous**
prim	first, chief, foremost	**prime**, (primitive), (prime minister), (prime number), **primary**
pro	for, foward	*proceed*, **procedure**, **process**, program, progress, **project**, promise, **promote**, **prospect**
psych	mind	**psychology**
quat, quad	four	(quadrangle), square
que, qui	ask	*acquire*, **acquisition**, inquire, inquiry, question, request, *require*, **required**
re	back, again	*react*, **reaction**, *readjust*, *reassess*, *reassign*, *recommence*, *reconstruct*, *recover*, **recovery**, *recreate*, *redefine*, *redistribute*, *redraft*, *reevaluate*, **refine**, reflect, reflection, *refocus*, *reformulate*, refuse, *reinforce*, **reinforced**, *reinterpret*, *reinvest*, *reject*, **rejected**, **release**, *relocate*, remind, *remove*, **removed**, *reoccur*, *reorient*, repeat, replace, reply, **resolution**, *resolve*, *respond*, **response**, **restore**, *restrain*, **restraints**, *restrict*, **restricted**, *retain*, **retained**, **reverse**, review, *revise*, **revision**
retro	backwards	(retroactive), (retrospect)
rupt	break	(corrupt), (disrupt), interrupt, interruption, (rupture)
sanct	holy	(saint), (sanction), (sanctuary)
scent, scend	climb	(ascent), descend, descent, descendant
sci, scio	know	conscience, conscious, science, scientist, scientific
sciss	cut	scissors
scrib, script	write	(conscript), describe, description, (manuscript), (prescribe), (scribble)
se	apart, move away from	(dissect), **section**, **sector**, **select**
sed, sess	sit	(sedentary), (session)
semi	half	(semiconductor), (semifinal)
sent, sens	feel, think	(biosensor), **consent**, sense, sensitive, (sentimental), (sensation)
sept	seven	(septennial), (septet)
sequ, secu	follow	(consecutive), *consequence*, **consequences**, **sequence**, **subsequent**, (sequel)
serv	watch, maintain, protect	(conserve), deserve, observe, preserve, reserve, servant, serve, service
simil	same	(assimilate), (facsimile), **similar**
soci	join, companion	association, (sociable), social, society, (sociology)
sol	alone	*isolate*, **isolated**, *sole*, **solely**, (solitary), (solo)
sol	sun	(parasol), (solar), (solstice)
solv, solu, solut	loosen, explain	absolute, *resolve*, **resolution**, (soluble), solution, solve
son	sound	(resonate), (sonar), (unison)

soph	wisdom, knowledge	*philosopher*, **philosophy**, (sophisticated), (sophomore)
spec, spic	look, see	*aspect*, **aspects**, *inspect*, **inspection**, **perspective**, **prospect**, **specific**, *specify*, **specified**, (spectator), (speculate)
spir	breath, soul	(inspire), (respiration)
spir	coil	(spiral)
spond, spons	promise, answer for	*correspond*, **corresponding**, *respond*, **response**, responsible
spont	by one's own force	(spontaneous)
sta, stan, stat	place, put, stand, stay	*assist*, **assistance**, *circumstance*, **circumstances**, **constant**, *establish*, **established**, **estate**, **instance**, *stable*, **stability**, stage, stand, station, **statistics**, **status**
stru, struct, stroy, stry	build	*construct*, **construction**, (destroy), destruction, destructive, (industry), **infrastructure**, *instruct*, **instructions**, **ministry**, **structure**
sub	under, below, from	*submit*, **submitted**, (submarine), **subordinate**, (subtitles), (subway)
sup, super, supra	over, above,	(superior), *supplement*, **supplementary**, (supernatural)
sym, syn	together, at the same time	(photosynthesis), sympathy, sympathetic, (synthesis), (syndicate)
tact, tang, tig, ting	touch	**contact**, (contiguous), (contingent), (tangible), touch
tain, ten, tent, tin	hold, keep, have	*attain*, **attained**, attentive, contain, content, discontent, entertain, *maintain*, **maintenance**, *obtain*, **obtained**, *retain*, **retained**, *sustain*, **sustainable**
tect, teg	cover	*detect*, **detected**, protect, protection
tele	distance, from afar	telegraph, telephone, television
temp	time	**contemporary**, **temporary**
tend, tens	stretch	*intense*, **intensity**, *tense*, **tension**
tera	trillion (10^{12})	(terabyte)
term	end, boundary, limit	(midterm), term, *terminate*, **termination**
terr	Earth	(subterranean), (terrain), (terrestrial)
test	see, witness	(attest), (testify)
theo, the	God	(polytheist), (theology)
therm	heat	(thermal), (thermodynamics), (thermometer)
tor, tors, tort	twist	*distort*, **distortion**, (torsion), (torture)
tract	drag, draw, pull	**abstract**, attract, attractive, attraction, **contract**, **extract**, (subtract), (tractor)
trans	across, beyond, change	**transfer**, *transform*, **transformation**, translate, translation, translator, **transition**, *transmit*, **transmission**, **transport**
tri	three	(triangle), (triglyceride), (triple)
ultra	beyond	(ultramicroscope), (ultrasound), (ultraviolet)

un	not, against, opposite	*unaccompanied*, *unaffected*, *unaided*, *unaltered*, *unalterable*, *unambiguous*, *unanticipated*, *unappreciated*, *unapproachable*, *unassigned*, *unassisted*, *unattached*, *unattainable*, *unavailable*, *unaware*, *unbiased*, *uncharted*, *uncommunicative*, *unconfined*, *unconstitutional*, *unconstrained*, *uncontroversial*, *unconventional*, *unconvinced*, *uncultured*, *undefined*, *undeniable*, *undiminished*, *uneconomical*, *unethical*, *unfounded*, *unidentifiable*, *uninjured*, *unintelligent*, *uninvolved*, *unjustified*, *unlicensed*, *unmodified*, *unmonitored*, *unmotivated*, *unobtainable*, *unparalleled*, *unprecedented*, *unpredictability*, *unpredictable*, *unprincipled*, *unpublished*, *unregulated*, *unreliable*, *unresolved*, *unresponsive*, *unrestrained*, *unrestricted*, *unrestrictive*, *unscheduled*, *unspecified*, *unstable*, *unstressed*, *unstructured*, *unsustainable*
uni	one	**unified**, *unify*, **uniform**, **unique**, union, unit, unite, unity, universal, universe, university
vac	empty	(vacant), (vacation), (vacuous), (vacuum)
veh, vect	carry	(convection), (vector), **vehicle**
ven, vent	come	adventure, avenue, *convene*, convenience, convenient, **convention**, event, *eventual*, **eventually**, *intervene*, **intervention**, invent, invention, inventor, prevent, prevention, revenge, **revenue**
ver	truth	(veracity), (verify), (verity)
vers, vert	turn, change	**controversy**, conversation, *converse*, **conversely**, *convert*, **converted**, **reverse**, **version**
vid, vie, vis	see	*evident*, **evidence**, review, *revise*, **revision**, **visible**, **vision**, (video), **visual**, view, visit, visitor
vit, viv	life	(revitalize), (revive), (vital), (vitality), (vitamins)
voc, voke	call	**advocate**, *invoke*, **invoked**, (vocabulary), (vocal), (revoke)
vol	roll, turn	*evolve*, **evolution**, *involve*, **involved**, (revolve), (revolver), **revolution**, **volume**

8.6 Suffixes

Words that are in **bold** are the most common words of each of the 570 word families of the Academic Word List. Words that are in *italic* are less common words of the 570 word families of the Academic Word List. Words that are neither in bold nor italic are common English words. They are all on the General Service Word List which comprises the most common 2284 English words. Words that are in parentheses are rare words that are neither on the General Service List nor on the Academic Word List.

Suffix	Example	Function
-able, -ible	*achievable*, *adaptable*, *alterable*, *appreciable*, *approachable*, *assessable*, *attainable*, *attributable*, **available**, **capable**, *collapsible*, *communicable*, *compatible*, *computable*, *conceivable*, *conformable*, **considerable**, *contactable*, *convertible*, *debatable*, *definable*, *demonstrable*, *deniable*, *detectable*, *disposable*, *flexible*, *identifiable*, *inaccessible*, *incapable*, **incompatible**, *inconceivable*, *inevitable*, *inflexible*, *invariable*, *invisible*, *irreversible*, *justifiable*, *obtainable*, *predictable*, *recoverable*, *reliable*, *removable*, *reversible*, *specifiable*, **sustainable**, *traceable*, *transferable*, *unalterable*, *unapproachable*, *unattainable*, *unavailable*, *undeniable*, *unidentifiable*, *unobtainable*, *unpredictable*, *unreliable*, *unstable*, *unsustainable*, **variable**, **visible**	Adjective
-age	**image**, *linkage*, *percentage*	Noun
-al, -ial, -ical	*abnormal*, *analytical*, **annual**, *beneficial*, **chemical**, **classical**, *coincidental*, *computational*, *conceptual*, **constitutional**, *contextual*, *controversial*, *conventional*, **crucial**, **cultural**, *cyclical*, *dimensional*, *distributional*, *economical*, **empirical**, *environmental*, **ethical**, *eventual*, *evidential*, **external**, **federal**, **final**, **financial**, *functional*, **fundamental**, **global**, **hierarchical**, *hypothetical*, **identical**, *ideological*, *illegal*, *illogical*, *incidental*, **individual**, **initial**, *institutional*, **integral**, **internal**, *irrational*, **legal**, **liberal**, *logical*, **manual**, **marginal**, *maturational*, **medical**, **mental**, *methodical*, *methodological*, **minimal**, *ministerial*, *multi-dimensional*, **mutual**, **neutral**, *non-traditional*, **normal**, **occupational**, *optional*, *phenomenal*, *philosophical*, **physical**, **potential**, **principal**, *procedural*, **professional**, *proportional*, *psychological*, **radical**, **rational**, *regional*, *residential*, *sequential*, *sexual*, *spherical*, *statistical*, *structural*, **technical**, *technological*, *terminal*, *textual*, *theoretical*, *topical*, **traditional**, *transitional*, *uncontroversial*, *unconventional*, *uneconomical*, *unethical*, *virtual*, **visual**	Adjective
-an	*logician*, *statistician*	Noun - person

-ance, -ence	**assistance**, **assurance**, *circumstance*, **coherence**, **coincidence**, **conference**, conformance, *consequence*, *correspondence*, *dominance*, *emergence*, *equivalence*, **evidence**, *ignorance*, **incidence**, inference, **instance**, **intelligence**, *irrelevance*, **maintenance**, *occurrence*, *persistence*, *precedence*, *predominance*, *relevance*, **reliance**, *reluctance*, *residence*, **sequence**, *significance*, *sustenance*, *transference*, *variance*	Noun
-ant, -ent	*assistant*, *consultant*, *immigrant*, *migrant*, *occupant*, *participant*, **resident**, *respondent*	Noun - person
-ant, -ent	*adjacent*, **apparent**, *coherent*, **concurrent**, *consistent*, **constant**, *consequent*, **dominant**, *emergent*, **equivalent**, *evident*, *ignorant*, *incoherent*, **inherent**, *insignificant*, *insufficient*, *intelligent*, *irrelevant*, **persistent**, *predominant*, **relevant**, *reliant* **reluctant**, **significant**, *subsequent*, **sufficient**, *unintelligent*, *variant*	Adjective
-ar, -ary, -ory	**arbitrary**, *compensatory*, *complementary*, **contemporary**, *contradictory*, **contrary**, *discretionary*, *dissimilar*, *evolutionary*, *exclusionary*, *migratory*, **military**, **nuclear**, *participatory*, **preliminary**, **primary**, *reactionary*, *regulatory*, *revolutionary*, **similar**, **supplementary**, **temporary**, *transitory*, **voluntary**	adjective
-ate	**accurate**, **adequate**, **appropriate**, *approximate*, **corporate**, *disproportionate*, *inaccurate*, *inadequate*, *intermediate*, *proportionate*, *ultimate*	Adjective
-ate	*accommodate*, *accumulate*, *administrate*, **advocate**, **aggregate**, *allocate*, *alternate*, *anticipate*, *appreciate*, **appropriate**, *approximate*, *automate*, *communicate*, *concentrate*, *cooperate*, *coordinate*, **create**, **debate**, **demonstrate**, *deregulate*, *deviate*, *differentiate*, *discriminate*, *domesticate*, *dominate*, **eliminate**, *equate*, **estimate**, *evaluate*, **facilitate**, *fluctuate*, *formulate*, *generate*, *illustrate*, *immigrate*, *implicate*, *incapacitate*, *incorporate*, **indicate**, *initiate*, *innovate*, *integrate*, *invalidate*, *investigate*, *isolate*, *legislate*, *liberate*, *locate*, *manipulate*, *mediate*, *migrate*, *motivate*, *negate*, *orientate*, *participate*, *predominate*, overestimate, *underestimate*, *reactivate*, *recreate*, *reevaluate*, *reformulate*, *regulate*, *relocate*, *simulate*, **subordinate**, *terminate*, *validate*, *violate*	Verb
-ation	**accommodation**, **accumulation**, **adaptation**, **administration**, *aggregation*, **allocation**, *alteration*, *anticipation*, **appreciation**, *approximation*, *automation*, categorization, *citation*, *clarification*, **communication**, **compensation**, *compilation*, *computation*, **concentration**, *conceptualization*, *confirmation*, *conformation*, **consultation**, *cooperation*, **coordination**, *corporation*, *creation*, *demonstration*, *denotation*, *deregistration*, *deregulation*, *derivation*, **deviation**, **differentiation**, **discrimination**, *diversification*, *documentation*, *domination*, *dramatization*, **duration**, *elimination*, **equation**, *estimation*, **evaluation**, **exploitation**, *externalization*, *facilitation*, *federation*, *fluctuation*, *formulation*, **foundation**, **generation**, *globalization*, *identification*, *illustration*, **immigration**, **implementation**,	Noun

-ation	*implication*, **inclination**, *incorporation*, *indication*, *initiation*, **innovation**, **integration**, *intensification*, **interpretation**, **investigation**, *isolation*, *itemization*, **justification**, **legislation**, *liberalization*, *liberation*, **location**, **manipulation**, *maturation*, *maximization*, **mediation**, *modification*, *misinterpretation*, **motivation**, *neutralization*, *normalization*, *occupation*, **orientation**, **participation**, *prioritization*, **publication**, **quotation**, *rationalization*, *reactivation*, *reevaluation*, *reformulation*, *registration*, *regulation*, *reinterpretation*, *relaxation*, *relocation*, *reorientation*, *restoration*, *revelation*, **simulation**, *specification*, *stabilization*, *subordination*, *summation*, *summarization*, **termination**, **transformation**, *transportation*, *unification*, *utilization*, *validation*, *variation*, **violation**, visualization	Noun
-cy	*accuracy*, *adequacy*, *advocacy*, *consistency*, *constancy*, *constituency*, *consultancy*, **currency**, *inaccuracy*, *inadequacy*, *inappropriacy*, *inconsistency*, *inconstancy*, *insufficiency*, *occupancy*, **policy**, *primacy*, *sufficiency*	Noun
-ed	*abandoned*, *accessed*, *accommodated*, **accompanied**, *accumulated*, *achieved*, *acknowledged*, *acquired*, *adapted*, *adjusted*, *advocated*, *affected*, *aggregated*, *aided*, *allocated*, *altered*, *amended*, *analyzed*, **anticipated**, *appended*, *appreciated*, *approached*, **approximated**, *assembled*, *assessed*, **assigned**, *assisted*, *assumed*, *assured*, **attached**, **attained**, **attributed**, *authored*, *automated*, *benefited*, *biased*, *bonded*, *briefed*, *categorized*, *ceased*, *challenged*, *channeled*, *charted*, **cited**, *clarified*, *coded*, *coincided*, *collapsed*, **commenced**, *commented*, *commissioned*, *committed*, *communicated*, *compensated*, **complied**, *complemented*, *compounded*, *comprised*, *computed*, **conceived**, *concentrated*, *conceptualized*, *concluded*, *conducted*, *conferred*, **confined**, **confirmed**, *conflicted*, *conformed*, *consented*, *consisted*, *constituted*, *constrained*, *constructed*, *consulted*, *consumed*, *contacted*, *contracted*, *contradicted*, *contrasted*, *contributed*, *convened*, **converted**, **convinced**, *cooperated*, *coordinated*, *cored*, *corresponded*, *coupled*, *created*, *credited*, *cycled*, *debated*, *declined*, *deduced*, *defined*, *demonstrated*, *denoted*, *denied*, *depressed*, *deregistered*, *deregulated*, **derived**, *designed*, **detected**, *deviated*, **devoted**, *differentiated*, **diminished**, *discriminated*, *disestablished*, *displaced*, *displayed*, *disposed*, **distorted**, *distributed*, *diversified*, *documented*, *domesticated*, *dominated*, *drafted*, *dramatized*, *edited*, *eliminated*, **emerged**, *emphasized*, *enabled*, **encountered**, *enforced*, **enhanced**, *ensured*, *equated*, *equipped*, *eroded*, **established**, *estimated*, *evaluated*, *evidenced*, *evolved*, *exceeded*, **excluded**, *exhibited*, *expanded*, *exploited*, *exported*, *exposed*, *externalized*, *extracted*, *facilitated*, *factored*, *featured*, *filed*, *finalized*, *financed*, *fluctuated*, *focused*, *formatted*, *formulated*, **founded**, *functioned*, *funded*, **generated**, *graded*, **granted**, *guaranteed*, **highlighted**, *hypothesized*, **identified**, **ignored**, **illustrated**, *immigrated,*	Verb

-ed	*impacted*, *implemented*, *implicated*, *implied*, **imposed**, *incapacitated*, *inclined*, **incorporated**, *indexed*, *indicated*, *individualized*, **induced**, **inferred**, *inhibited*, *initiated*, *injured*, *innovated*, *inserted*, *inspected*, *instituted*, *instructed*, *integrated*, *intensified*, *interacted*, *internalized*, *interpreted*, *intervened*, *invested*, *investigated*, **invoked**, **involved**, **isolated**, *issued*, itemized, *justified*, *labeled*, *labored*, *layered*, *lectured*, *legislated*, *liberalized*, *liberated*, *licensed*, *linked*, *located*, *maintained*, *manipulated*, *matured*, *maximized*, *mediated*, *migrated*, **minimized**, *ministered*, *misinterpreted*, **modified**, **monitored**, *motivated*, *negated*, *networked*, *neutralized*, *normalized*, **obtained**, *occupied*, *occurred*, *orientated*, *oriented*, *overestimated*, *overlapped*, *paneled*, *paralleled*, *participated*, **perceived**, *persisted*, *phased*, *philosophized*, **posed**, *preceded*, **predicted**, *predominated*, *presumed*, *prioritized*, *proceeded*, *processed*, **prohibited**, *projected*, *promoted*, **published**, *purchased*, *pursued*, *quoted*, *ranged*, *rationalized*, *reacted*, *readjusted*, *reassessed*, *reassigned*, *recommenced*, *reconstructed*, *recovered*, *recreated*, *redefined*, *redistributed*, *redrafted*, *reevaluated*, *refined*, *refocused*, *reformulated*, **registered**, *regulated*, **reinforced**, **reinterpreted**, *reinvested*, **rejected**, **relaxed**, *released*, *relied*, **relocated**, **removed**, *reoccurred*, **required**, **rescheduled**, *researched*, *resided*, *resolved*, *resourced*, *responded*, *restored*, *restrained*, **restricted**, *restructured*, **retained**, **revealed**, *reversed*, *revised*, *revolutionized*, *routed*, *schemed*, *sectioned*, *secured*, *selected*, *sequenced*, *shifted*, *signified*, *simulated*, *sourced*, **specified**, *stabilized*, *stressed*, *structured*, *styled*, *stylized*, **submitted**, *subsidized*, *substituted*, *summed*, *summarized*, *supplemented*, *surveyed*, *survived,* **suspended**, *sustained*, *symbolized*, *taped*, *targeted*, *teamed*, *terminated*, *traced*, *transferred*, *transformed*, *transited*, *transmitted*, *transported*, *triggered*, *underestimated*, **unified**, *utilized*, *validated*, *varied*, *violated*, *visualized*, *volunteered*	Verb
-ed	*abandoned*, *achieved*, **acknowledged**, *acquired*, *adjusted*, *affected*, *altered*, *amended*, **anticipated**, *appreciated*, *assembled*, **assigned**, *assisted*, *assumed*, *assured*, **attached**, **attained**, *automated*, *biased*, *bonded*, *categorized*, *challenged*, *clarified*, *coded*, *collapsed*, *commissioned*, *committed*, *compensated*, *compounded*, *computerized*, **conceived**, *concentrated*, **confined**, **confirmed**, *conflicted*, **converted**, *contracted*, *coordinated*, *cored*, *coupled*, *cultured*, *defined*, *depressed*, **derived**, **devoted**, **diminished**, *disposed*, **distorted**, *distributed*, *edited*, *eliminated*, **enhanced**, *expanded*, *established*, *exposed*, *featured*, *formatted*, *formulated*, **generated**, *graded*, *guaranteed*, **highlighted**, **illustrated**, *incapacitated*, *inclined*, **incorporated**, *injured*, *integrated*, **isolated**, *labored*, *layered*, *licensed*, **modified**, *motivated*, *neutralized*, *orientated*, *oriented*, *paneled*, **perceived**, *principled*, *processed*, *projected*, **published**, *recycled*, *refined*, *reformulated*, **registered**, **reinforced**, **relaxed**, **removed**, **required**, *resolved*, *restored*, *restrained*, **restricted**, *restructured*, *revised*, *stressed*, *structured*, *styled*, *stylized*, *subsidized*, *substituted*,	Adjective

-ed	**suspended**, *taped*, *transformed*, *transmitted*, *transported*, *unaccompanied*, *unaffected*, *unaided*, *unaltered*, *unanticipated*, *unappreciated*, *unassigned*, *unassisted*, *unattached*, *unbiased*, *uncharted*, *unconfined*, *unconstrained*, *unconvinced*, *uncultured*, *undiminished*, *unfounded*, *uninjured*, *uninvolved*, *unjustified*, *unlicensed*, *unmodified*, *unmonitored*, *unmotivated*, *unparalleled*, *unprecedented*, *unprincipled*, *unpublished*, *unregulated*, *unresolved*, *unrestrained*, *unrestricted*, *unscheduled*, *unspecified*, *unstressed*, *unstructured*, *varied*	Adjective
-en	brighten, darken, deafen, deepen, fatten, flatten, frighten, harden, heighten, lengthen, lessen, lighten, loosen, madden, redden, ripen, sadden, sharpen, shorten, soften, stiffen, straighten, strengthen, sweeten, thicken, threaten, tighten, weaken, whiten, widen	Verb
-en	golden, wooden, woolen	Adjective
-er, -or	**alter**, **author**, *confer*, *deregister*, *encounter*, *infer*, **layer**, *recover*, *register*, **transfer**, **trigger**, *volunteer*	Verb
-er, -or	*administrator*, *analyzer*, *challenger*, *commentator*, *commissioner*, **consumer**, *contractor*, *contributor*, *coordinator*, *creator*, *creditor*, *demonstrator*, *designer*, *distributor*, *editor*, *exporter*, *facilitator*, *financier*, *founder*, *funder*, *innovator*, *inspector*, *instructor*, *investor*, *investigator*, *lecturer*, *legislator*, *liberator*, *occupier*, *philosopher*, **practitioner**, *promoter*, *publisher*, *purchaser*, *regulator*, *researcher*, *selector*, *successor*, *survivor*, *volunteer*	Noun - person
-er, -or	*analyzer*, (Challenger), **computer**, *detector*, *indicator*, *reactor*, *transporter*	Noun - thing
-est	best, earnest, honest, modest, *tensest*	Adjective
-fold	(twofold), (fourfold), (sevenfold)	Adverb
-ful	grateful, *insightful*, *resourceful*, *stressful*	Adjective
-ify	*clarify*, *diversify*, *identify*, *intensify*, *justify*, *modify*, *signify*, *specify*, *unify*	Verb
-ia	*academia*, **criteria**, **media**	Noun
-ic	**academic**, *analytic*, *automatic*, *classic*, *cyclic*, **domestic**, **dramatic**, **dynamic**, **economic**, *emphatic*, *energetic*, **ethnic**, *individualistic*, **intrinsic**, *periodic*, *schematic*, **specific**, *strategic*, **symbolic**, *thematic*	Adjective
-ics	*classics*, *dynamics*, *economics*, *ethics*, politics, **statistics**	Noun - subject

-ing	*abandoning*, *accessing*, *accommodating*, *accompanying*, *accumulating*, *achieving*, *acknowledging*, *acquiring*, *adapting*, *adjusting*, *advocating*, *affecting*, *aggregating*, *aiding*, *allocating*, *altering*, *alternating*, *amending*, *analyzing*, *anticipating*, *appending*, *appreciating*, *approaching*, *approximating*, *assembling*, *assessing*, *assigning*, *assisting*, *assuming*, *assuring*, *attaching*, *attaining*, *attributing*, *authoring*, *automating*, *benefiting*, *biasing*, *bonding*, *briefing*, *categorizing*, *ceasing*, *challenging*, *channeling*, *charting*, *citing*, *clarifying*, *coding*, *coinciding*, *collapsing*, *commencing*, *commenting*, *commissioning*, *committing*, *communicating*, *compensating*, *compiling*, *complementing*, *compounding*, *comprising*, *computing*, *conceiving*, *concentrating*, *conceptualizing*, *concluding*, *conducting*, *conferring*, *confining*, *confirming*, *conflicting*, *conforming*, *consenting*, *consisting*, *constituting*, *constraining*, *constructing*, *consulting*, *consuming*, *contacting*, *contextualizing*, *contracting*, *contradicting*, *contrasting*, *contributing*, *convening*, *converting*, *convincing*, *cooperating*, *coordinating*, *coring*, **corresponding**, *coupling*, *creating*, *crediting*, *cycling*, *debating*, *declining*, *deducing*, *defining*, *demonstrating*, *denoting*, *denying*, *depressing*, *deregistering*, *deregulating*, *deriving*, *designing*, *detecting*, *deviating*, *devoting*, *differentiating*, *diminishing*, *discriminating*, *disestablishing*, *displacing*, *displaying*, *disposing*, *distorting*, *distributing*, *diversifying*, *documenting*, *domesticating*, *dominating*, *drafting*, *dramatizing*, *editing*, *eliminating*, *emerging*, *emphasizing*, *enabling*, *encountering*, *enforcing*, *enhancing*, *ensuring*, *equating*, *equipping*, *eroding*, *establishing*, *estimating*, *evaluating*, *evolving*, *exceeding*, *excluding*, *exhibiting*, *expanding*, *exploiting*, *exporting*, *exposing*, *externalizing*, *extracting*, *facilitating*, *factoring*, *featuring*, *filing*, *finalizing*, *financing*, *fluctuating*, *focusing*, *formatting*, *formulating*, *founding*, *functioning*, *funding*, *generating*, *grading*, *granting*, *guaranteeing*, *highlighting*, *hypothesizing*, *identifying*, *ignoring*, *illustrating*, *immigrating*, *impacting*, *implementing*, *implicating*, *implying*, *imposing*, *inclining*, *incorporating*, *indexing*, *indicating*, *inducing*, *inferring*, *inhibiting*, *initiating*, *injuring*, *innovating*, *inserting*, *inspecting*, *instituting*, *institutionalizing*, *instructing*, *integrating*, *intensifying*, *interacting*, *internalizing*, *interpreting*, *intervening*, *investing*, *investigating*, *invoking*, *involving*, *isolating*, *issuing*, *itemizing*, *justifying*, *labeling*, *laboring*, *layering*, *lecturing*, *legalizing*, *liberalizing*, *liberating*, *licensing*, *linking*, *locating*, *maintaining*, *manipulating*, *maturing*, *maximizing*, *mediating*, *migrating*, *minimizing*, *ministering*, *misinterpreting*, *modifying*, **monitoring** *motivating*, *negating*, *networking*, *neutralizing*, *normalizing*, *obtaining*, *occupying*, *occurring*, *offsetting*, *orientating*, *orienting*, *overestimating*, *overlapping*, *paneling*, *paragraphing*, *participating*, *perceiving*, *persisting*, *phasing*, *philosophizing*, *posing*, *preceding*, *predicting*, *predominating*, *presuming*, *prioritizing*, *proceeding*, *processing*, *prohibiting*, *projecting*, *promoting*, *publishing*, *purchasing*, *pursuing*,	Verb - present participle

-ing	*quoting*, *ranging*, *rationalizing*, *reacting*, *readjusting*, *reassessing*, *reassigning*, *recommencing*, *reconstructing*, *recovering*, *recreating*, *redefining*, *redistributing*, *redrafting*, *reevaluating*, *refocusing*, *reformulating*, *registering*, *regulating*, *reinforcing*, *reinterpreting*, *reinvesting*, *rejecting*, *relaxing*, *releasing*, *relocating*, *relying*, *removing*, *reoccurring*, *requiring*, *rescheduling*, *researching*, *residing*, *resolving*, *resourcing*, *responding*, *restoring*, *restraining*, *restricting*, *restructuring*, *retaining*, *revealing*, *reversing*, *revising*, *revolutionizing*, *routing*, *scheduling*, *scheming*, *sectioning*, *securing*, *seeking*, *selecting*, *sequencing*, *shifting*, *signifying*, *simulating*, *sourcing*, *specifying*, *stabilizing*, *stressing*, *structuring*, *styling*, *stylizing*, *submitting*, *subsidizing*, *substituting*, *summing*, *summarizing*, *supplementing*, *surveying*, *surviving*, *suspending*, *sustaining*, *symbolizing*, *taping*, *targeting*, *teaming*, *terminating*, *tracing*, *transferring*, *transforming*, *transiting*, *transmitting*, *transporting*, *triggering*, *undergoing*, ***underlying***, *underestimating*, *undertaking*, *unifying*, *utilizing*, *validating*, *varying*, *violating*, *visualizing*, *volunteering*	Verb - present participle
-ion	*abstraction*, **accommodation**, **accumulation**, **acquisition**, **adaptation**, **administration**, *aggregation*, **allocation**, *alteration*, *anticipation*, **appreciation**, *approximation*, *assumption*, *attribution*, *automation*, *categorization*, *citation*, *clarification*, **commission**, **communication**, **compensation**, *compilation*, *computation*, **concentration**, *conception*, *conceptualization*, **conclusion**, *confirmation*, *conformation*, *constitution*, **construction**, **consultation**, **contradiction**, **contribution**, **convention**, *conversion*, *cooperation*, **coordination**, *corporation*, *creation*, *criterion*, **deduction**, **definition**, *demonstration*, *denotation*, **depression**, *deregistration*, *deregulation*, *derivation*, *detection*, **deviation**, *devotion*, **differentiation**, *dimension*, *diminution*, **discretion**, *disproportion*, **distinction**, *distortion*, **distribution**, *diversification*, *documentation*, *domination*, *dramatization*, **duration**, **edition**, *elimination*, **equation**, **erosion**, *estimation*, **evaluation**, **evolution**, *exclusion*, *exhibition*, **expansion**, *expansionism*, **exploitation**, *externalization*, *extraction*, *facilitation*, *federation*, *fluctuation*, *formulation*, **foundation**, **function**, **generation**, **globalization**, *identification*, *illustration*, **immigration**, **implementation**, *implication*, *imposition*, **inclination**, *incorporation*, *indication*, *induction*, *indiscretion*, **inhibition**, *initiation*, **innovation**, *insertion*, **inspection**, *institution*, *instruction*, **integration**, *intensification*, *intension*, **interaction**, **interpretation**, **intervention**, **investigation**, *isolation*, *itemization*, **justification**, **legislation**, *liberalization*, *liberation*, **location**, **manipulation**, *maturation*, *maximization*, **mediation**, **migration**, *mineralization*, *modification*, **motivation**, *neutralization*, *normalization*, **notion**, *occupation*, **option**, **orientation**, **participation**, *perception*, **portion**, *precision*, *prediction*, **presumption**, *prioritization*, *prohibition*,	Noun

-ion	*projection*, *promotion*, **proportion**, **publication**, **quotation**, *rationalization*, **reaction**, **region**, *reconstruction*, *redistribution*, *reevaluation*, *reformulation*, *registration*, *reinterpretation*, *rejection*, *relaxation*, *relocation*, *reorientation*, **resolution**, *restoration*, *restriction*, *retention*, *revelation*, **revision**, **revolution**, **section**, *selection*, **simulation**, *specification*, *stabilization*, *submission*, *subordination*, **substitution**, *succession*, *summation*, *summarization*, *suspension*, **tension**, **termination**, *tradition*, **transformation**, **transition**, **transmission**, *transportation*, *unification*,*utilization*, *validation*, *variation*, **version**, **violation**, **vision**, *visualization*	Noun
-ish	English, *stylish*	Adjective
-ism	*empiricism*, *expansionism*, *individualism*, *isolationism*, *liberalism*, ***mechanism***, *professionalism*, *rationalism*, *sexism*, *symbolism*	Noun
-ist	*environmentalist*, *evolutionist*, *exclusionist*, *individualist*, *minimalist*, *psychologist*, *revolutionist*, scientist, *strategist*, *theorist*, *traditionalist*	Noun - person
-ity	*accessibility*, *adaptability*, *ambiguity*, **authority**, *availability*, *brevity*, *capability*, **capacity**, **clarity**, **commodity**, **community**, *compatibility*, *complexity*, *conformability*, **conformity**, *creativity*, **diversity**, *enormity*, *entity*, *ethnicity*, *eventuality*, *externality*, *facility*, *finality*, **flexibility**, *illegality*, *immaturity*, *incompatibility*, *inflexibility*, *identity*, *individuality*, *inevitability*, *insecurity*, *instability*, **intensity**, **integrity**, *intensity*, *invalidity*, *invisibility*, *legality*, *majority*, *maturity*, *mentality*, *minority*, *neutrality*, *nonconformity*, *normality*, *objectivity*, *passivity*, *predictability*, **priority**, *rationality*, *reliability*, *rigidity*, **security**, *sexuality*, *similarity*, *specificity*, **stability**, *sustainability*, *uniformity*, *unpredictability*, **utility**, **validity**, *variability*, *visibility*	Noun
-ive	*adaptive*, *administrative*, *affective*, **alternative**, *communicative*, **comprehensive**, *conclusive*, *constitutive*, *constructive*, *consultative*, *contrastive*, **cooperative**, *creative*, *definitive*, *demonstrative*, *derivative*, *distinctive*, *distributive*, *evaluative*, *exclusive*, *expansive*, *illustrative*, *inconclusive*, *indicative*, *innovative*, *instructive*, *intensive*, *interactive*, *interpretative*, *interpretive*, *investigative*, *legislative*, *manipulative*, **negative**, *objective*, **passive**, **positive**, *prohibitive*, *prospective*, **qualitative**, *reactive*, *responsive*, *restrictive*, *retentive*, *selective*, **successive**, *uncommunicative*, *unresponsive*, *unrestrictive*	Adjective
-ize, -ise	*categorize*, *comprise*, *conceptualize*, *contextualize*, *civilize*, *dramatize*, *emphasize*, *externalize*, *finalize*, *hypothesize*, *institutionalize*, *internalize*, *itemize*, *liberalize*, *maximize*, *minimize*, *neutralize*, *normalize*, organize, *philosophize*, *prioritize*, *rationalize*, realize, recognize, *revise*, *revolutionize*, *stabilize*, *stylize*, *subsidize*, *summarize*, *symbolize*, *utilize*, *visualize*	Verb
-less	*ceaseless*, (colorless), (defenseless), (homeless), (jobless)	Adjective

-ly	*abnormally*, *abstractly*, *academically*, *accurately*, *adequately*, *administratively*, *affectively*, *alternatively*, *analytically*, *annually*, *apparently*, *appreciably*, *appropriately*, *approximately*, *arbitrarily*, *assuredly*, **automatically**, **briefly**, **chemically**, **coherently**, *communicatively*, *comprehensively*, *conceivably*, *conceptually*, *conclusively*, *concurrently*, *consequently*, *considerably*, *consistently*, *constantly*, *constitutionally*, *contrarily*, *controversially*, *conventionally*, **conversely**, *convincingly*, *cooperatively*, *correspondingly*, *creatively*, *crucially*, *culturally*, *definitely*, *demonstrably*, *demonstratively*, *devotedly*, *discretely*, *disproportionately*, *distinctively*, *distinctly*, *diversely*, *domestically*, *dramatically*, *dynamically*, *economically*, *emphatically*, *empirically*, *energetically*, *enormously*, *environmentally*, *erroneously*, *ethically*, **eventually**, *evidently*, *exclusively*, *expertly*, *explicitly*, *finally*, *financially*, *inappropriately*, *infinitely*, *functionally*, *fundamentally*, *globally*, *hypothetically*, *identically*, *ideologically*, *illegally*, *illogically*, *implicitly*, *inadequately*, *incidentally*, *incoherently*, *inconceivably*, *inconclusively*, *inconstantly*, *indefinitely*, *indistinctly*, *individually*, **inevitably**, *inherently*, *initially*, *insignificantly*, *institutionally*, *insufficiently*, *intelligently*, *intensely*, *intensively*, *interactively*, *internally*, *intrinsically*, *invariably*, *justifiably*, *legally*, *liberally*, *logically*, *manually*, *marginally*, *medically*, *mentally*, *minimally*, *mutually*, *negatively*, *normally*, *objectively*, *obviously*, *passively*, *periodically*, *persistently*, *philosophically*, *physically*, *positively*, *potentially*, *precisely*, *predictably*, **predominantly**, *presumably*, *previously*, *primarily*, *principally*, *professionally*, *proportionally*, *proportionately*, *psychologically*, *qualitatively*, *radically*, *randomly*, *rationally*, *regionally*, *reluctantly*, *reliably*, *restrictively*, *rigidly*, *schematically*, *securely*, *selectively*, *sequentially*, *sexually*, *significantly*, *similarly*, **solely**, *specifically*, *spherically*, *statistically*, *strategically*, *structurally*, *subsequently*, *successively*, *sufficiently*, *symbolically*, *technically*, *technologically*, *temporarily*, *tensely*, *thematically*, *theoretically*, *traditionally*, *unambiguously*, **ultimately**, *uniformly*, *uniquely*, *validly*, *variably*, **virtually**, *visibly*, *visually*, *voluntarily*	Adverb
-ment	*abandonment*, *accompaniment*, *achievement*, *acknowledgement*, **adjustment**, **amendment**, **assessment**, *assignment*, *attachment*, *attainment*, *commencement*, *comment*, **commitment**, **complement**, *disestablishment*, **displacement**, **document**, *element*, **enforcement**, *enhancement*, **environment**, **equipment**, *establishment*, *implement*, **investment**, *involvement*, *readjustment*, *reassessment*, *refinement*, *reinforcement*, *requirement*, *reinvestment*, *supplement*	Noun
-ness	*appropriateness*, *arbitrariness*, *awareness*, *intenseness*, *randomness*, *responsiveness*, *uniqueness*	Noun
-ology	(biology), (cosmology), (ecology), **ideology**, *methodology*, **psychology**, **technology**, (zoology)	Noun

-ous	**ambiguous**, ambitious, **analogous**, anxious, cautious, conscious, curious, **enormous**, *erroneous*, **obvious**, precious, **previous**, serious, suspicious, *unambiguous*, various	Adjective
-ship	*authorship*, companionship, fellowship, friendship, leadership, membership, ownership, **partnership**, worship	Noun
-ure	adventure, agriculture, creature, *culture*, enclosure, **exposure**, failure, figure, *feature*, furniture, future, **infrastructure**, **lecture**, *legislature*, literature, manufacture, measure, mixture, nature, picture, pleasure, pressure, *procedure*, signature, **structure**, temperature, treasure	Noun
-ward	awkward, backward, forward, inward, outward, **straightforward**, toward	Adverb

8.7 Symbols, Units, and Constants

The Greek Alphabet

Greek letters are used as symbols for constants and special functions in science, engineering and mathematics.

alpha	A	α	iota	I	ι	rho	P	ρ
beta	B	β	kappa	K	κ	sigma	Σ	σ
gamma	Γ	γ	lambda	Λ	λ	tau	T	τ
delta	Δ	δ	mu	M	μ	upsilon	Y	υ
epsilon	E	ε	nu	N	ν	phi	Φ	φ
zeta	Z	ζ	xi	Ξ	ξ	chi	X	χ
eta	H	η	omicron	O	ο	psi	Ψ	ψ
theta	Θ	θ	pi	Π	π	omega	Ω	ω

SI Prefixes

The International System of Units is the standard metric system used in science.

Name	Symbol	Factor		Name	Symbol	Factor
yotta	Y	10^{24}		deci	d	10^{-1}
zetta	Z	10^{21}		centi	c	10^{-2}
exa	E	10^{18}		milli	m	10^{-3}
peta	P	10^{15}		micro	μ	10^{-6}
tera	T	10^{12}		nano	n	10^{-9}
giga	G	10^{9}		pico	p	10^{-12}
mega	M	10^{6}		femto	f	10^{-15}
kilo	k	10^{3}		atto	a	10^{-18}
hecto	h	10^{2}		zepto	z	10^{-21}
deka	da	10^{1}		yocto	y	10^{-24}

8.7 Symbols, Units, and Constants

SI Units

There are seven fundamental units.

Name	Symbol	Measure
meter	m	length
kilogram	kg	mass
second	s	time
ampere	A	electric current
kelvin	k	temperature
mole	mol	amount of substance
candela	cd	luminous intensity

Science Constants

Constant	Symbol	Value in SI units
acceleration of free fall	g	9.80665 m s^{-2}
Avogadro constant	L, N_A	6.0221417× 10^{23} mol^{-1}
Boltzmann constant	k, k_B	1.3806503 × 10^{-23} m^2 kg s^{-2} K^{-1}
Permittivity of free space	ε_0	8.8541878 × 10^{-12} F m^{-1}
electron rest mass	m_e	9.1093897 × 10^{-31} kg
elementary charge	e	1.6021764 × 10^{-19} C
Faraday constant	F	9.6485339 × 10^7 C mol^{-1}
gas constant	R	8.3144722 J K^{-1} mol^{-1}
gravitational constant	G	6.67428 × 10^{-11} m^3 kg-1 s^{-2}
Loschmidt's number	n_0	2.6867774 × 10^{25} m^{-3}
magnetic constant	μ_0	4 x (pi)× 10^{-7} NA^{-2}
Planck constant	*h*	6.6260689 × 10^{-34} J s
speed of light	c	2.99792458 × 10^8 m s^{-1}
Stefan-Boltzmann constant	ρ	5.6704004× 10^{-8} W m^{-2} K^{-4}

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